APPENDIX C

Groundwater baseline report
(Eco Aqua)

WATER & ENVIRONMENTAL SPECIALISTS

REPTILE URANIUM NAMIBIA

OMAHOLA PROJECT

Groundwater Monitoring - Baseline Report

Version – 2

December 2010

Client Name: Reptile Uranium Namibia (Pty) Ltd

Project Number: 10-007

REPTILE URANIUM NAMIBIA

OMAHOLA PROJECT

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Title	Groundwater Monitoring – Baseline Report		
Name	Name	Signature	Date
Author	Mark Stanton		12 December 2010

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1. Introduction

Reptile Uranium Namibia (Pty) Ltd is a uranium exploration company operating in the Erongo Region of Namibia. Reptile Uranium Namibia is currently in the process of developing the Omahola Project. The Omahola Project comprises the INCA uranium and iron deposit, the Tubas Red Sand uranium deposit and the Shiyela iron deposit. The development of the project has initiated various feasibility studies, permit applications and environmental assessments. A component of this process is a groundwater monitoring campaign that will provide baseline data to be incorporated into the relevant studies and assessments, as well as long term monitoring data to ensure environmental compliance.

Reptile Uranium Namibia tasked Eco Aqua Water and Environmental Specialists to conduct the groundwater monitoring campaign.

2. Project Description

2.1 Project Location

Reptile Uranium Namibia is based in Swakopmund, a coastal town in the Erongo Region of Namibia. Exploration is conducted to the southeast of Swakopmund in the Namib Naukluft Park. The Omahola Project is located within Exclusive Prospecting Licence (EPL) 3496, an area known as Tubas (Figure 1).

The feasibility of three possible mining areas within EPL 3496 are being evaluated, namely the INCA uranium and iron deposit, the Tubas Red Sand uranium deposit, and the Shiyela iron deposit.

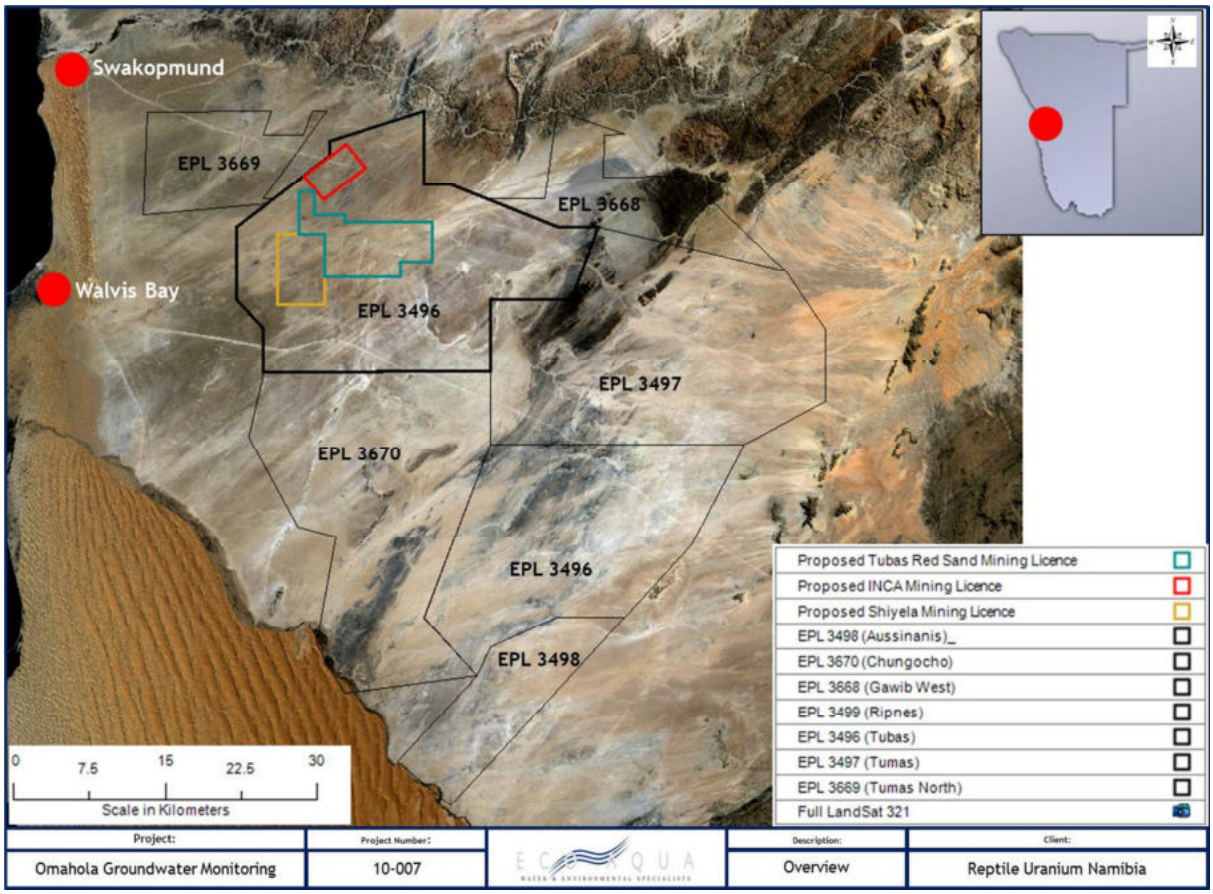

Figure 1: Locality Map – Reptile Uranium Namibia

2.2 Scope of Work

Eco Aqua Water and Environmental Specialists CC has been tasked by Reptile Uranium Namibia to conduct a groundwater campaign for the Omahola Project. The aim of the campaign is to provide:

- Baseline Groundwater Data; and
- Long Term Monitoring Data.

The Baseline Groundwater Data is to be incorporated into numerous studies, including amongst others:

- The Omahola Project Environmental Impact Assessment (EIA);

- The Desalination Feasibility Study;
- Mining Pre-Feasibility and Feasibility Studies; and
- Relevant Permit Applications.

The Long Term Monitoring Data will be required as a component of the Environmental Management Plan (EMP), as set out by the EIA process, in order to ensure long term environmental compliance.

3. Methodology

3.1 Monitoring Hole Locations

The Omahola Project comprises of the INCA uranium and iron deposit, the Tubas Red Sand uranium deposit, and the Shiyela iron deposit (Figure 2).

The selection of locations for the monitoring holes is critical to the success and longevity of a groundwater monitoring project. The locations were determined using uranium exploration lithological log data and aerial Electro-Magnetic (EM) survey data according to the following criteria:

- Location relative to proposed pits and satellite pits;
- The presence of water in the uranium exploration lithological log data; and
- The absence of mineralisation in the uranium exploration lithological log data.

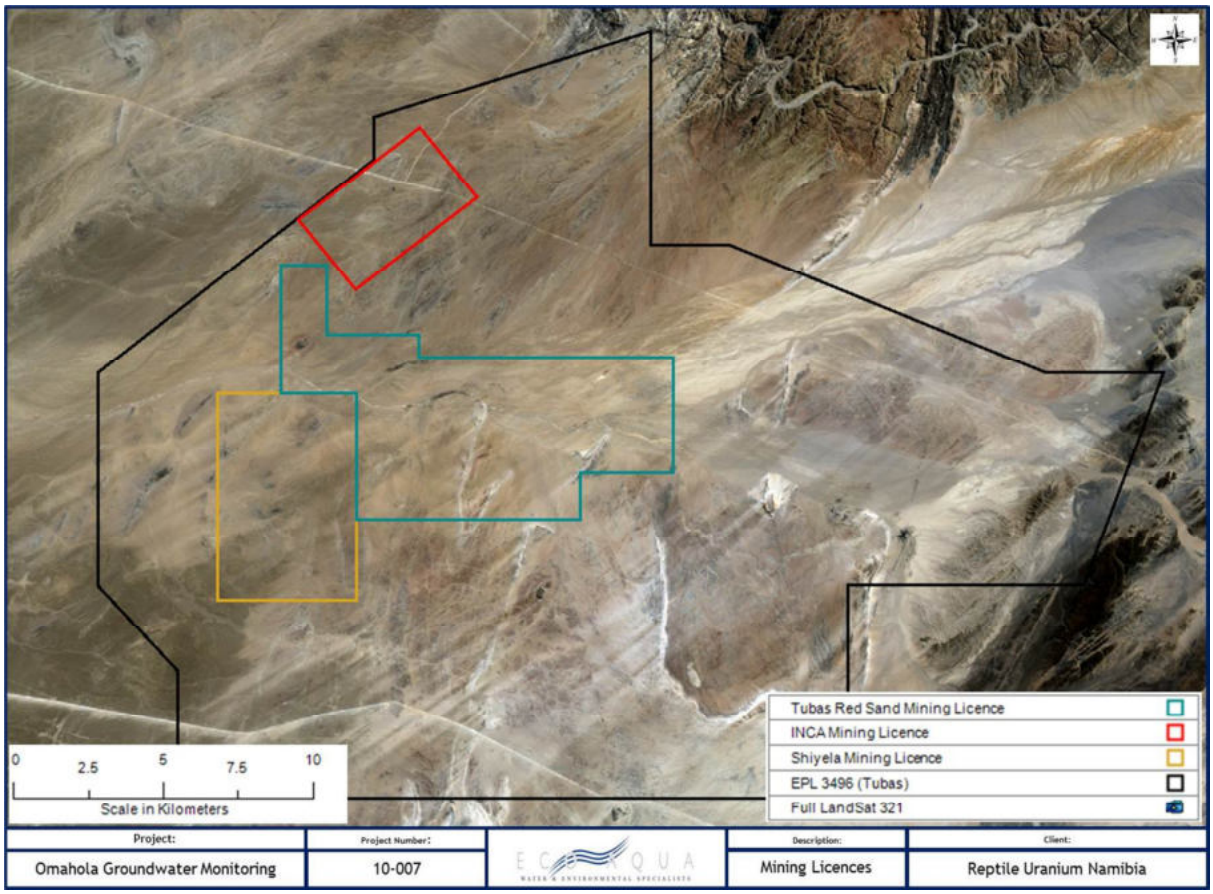

Figure 2: Locality Map – Proposed INCA, Tubas Red Sand and Shiyela Mining Licences.

INCA

INCA comprises 2 proposed pits – the main pit and one satellite pit. Regional groundwater flows from the northeast to the southwest. Three (3) monitoring holes were located surrounding the main pit, namely INCW1, INCW2 and INCW3. INCW1 represents the groundwater upstream of the main pit, and INCW2 and INCW3 represent groundwater downstream of the main pit. INCW5 and INCW4 represent the groundwater upstream and downstream of the satellite pit respectively (Figure 3). Detailed drilling logs are provided in Appendix A.

INCW6 represents the overall upstream groundwater for the INCA project as the full extent of the proposed main pit is not yet known. In addition, INCW6 will be able to provide data for Reptile Uranium Namibia's Alaskite Project should that be developed further (Figure 3).

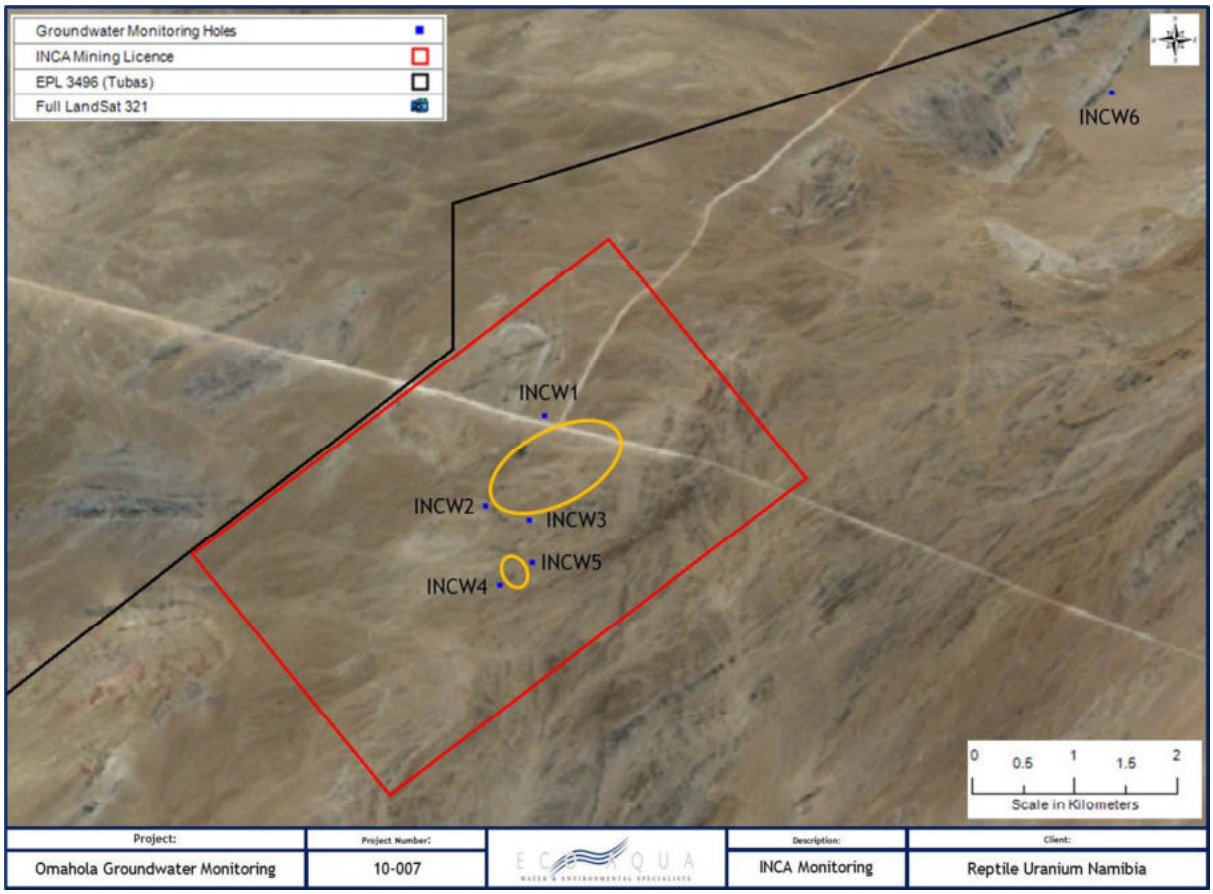

Figure 3: Locality Map – INCA Monitoring Holes

Tubas Red Sand

Tubas Red Sand comprises one (1) proposed pit. Regional groundwater flow follows the Tumas River and Tubas Paleochannel flowing from east to west. TUBW1, TUBW2 and TUBW5 represent the groundwater upstream of the pit. TUBW6 represents the groundwater downstream of the pit. TUBW6 also represents additional downstream data for the INCA project, as well as baseline data for Reptile Uranium Namibia's Shiyela Project (Figure 4). TUBW7 did not source water.

TUBW3 and TUBW4 are additional boreholes that were installed for the Desalination Feasibility Study. The boreholes were designed to be suitable for monitoring purposes and are included in the monitoring campaign for the baseline data (Figure 4).

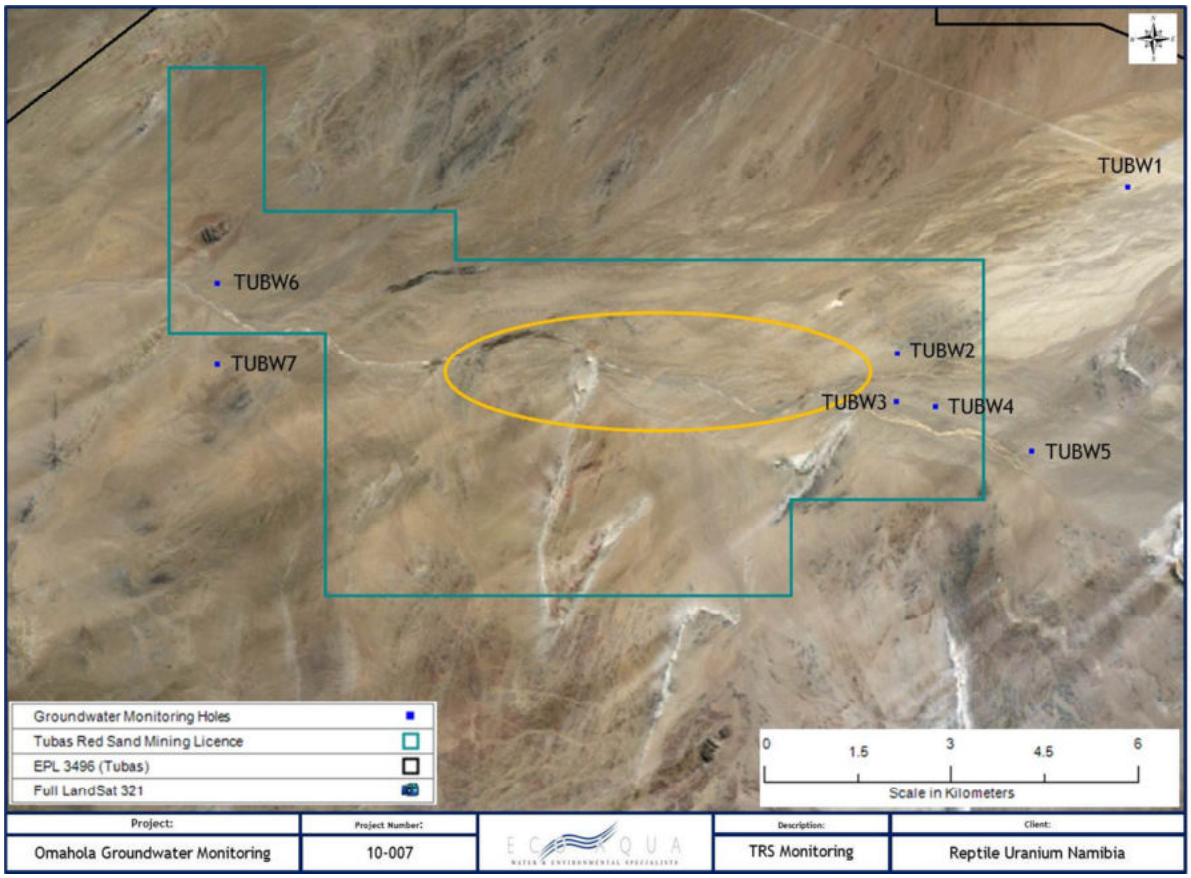

Figure 4: Locality Map – Tubas Red Sand Monitoring Holes

Shiyela

Reptile Uranium Namibia's Shiyela Project is still at a relatively early stage with respect to exploration. The delineation of the deposit is not yet complete and as such, the groundwater monitoring holes for this specific project will be defined and completed at an appropriate stage. TUBW6 however does provide upstream data values. TUBW7 did not source water (Figure 5).

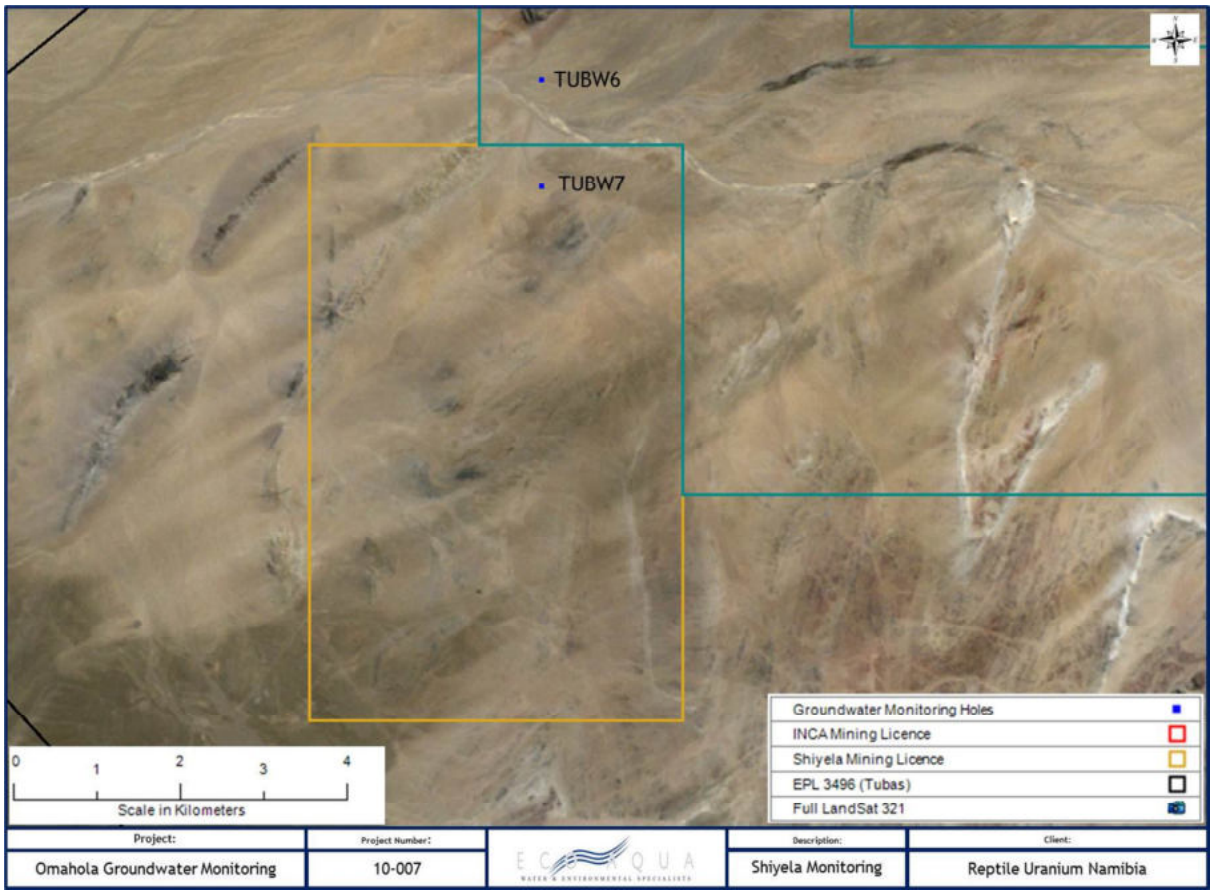

Figure 5: Locality Map – Shiyela Monitoring Holes

3.2 Monitoring Hole Design

The monitoring holes were drilled via the Reverse Circulation (RC) method with a 6 (six) inch diameter. The holes surrounding the INCA deposit (INCW holes) were drilled to a depth of approximately 100 metres. The monitoring holes located within the Tumas/Tubas channels were drilled to basement. A standard design was applied to the construction of the monitoring holes (Figure 6). The casing installed is 5 (five) inch non-perforated and perforated PVC. The slots of the perforated PVC are 2mm. 5-10mm gravel pack was installed to above the perforated casing to ensure water flow continuity. A 1.5 metre bentonite seal was installed near surface. Each hole was stabilised and sealed with an approximately 1x1 metre concrete slab. All monitoring holes were fitted with lockable caps and locks to ensure tampering does not occur.

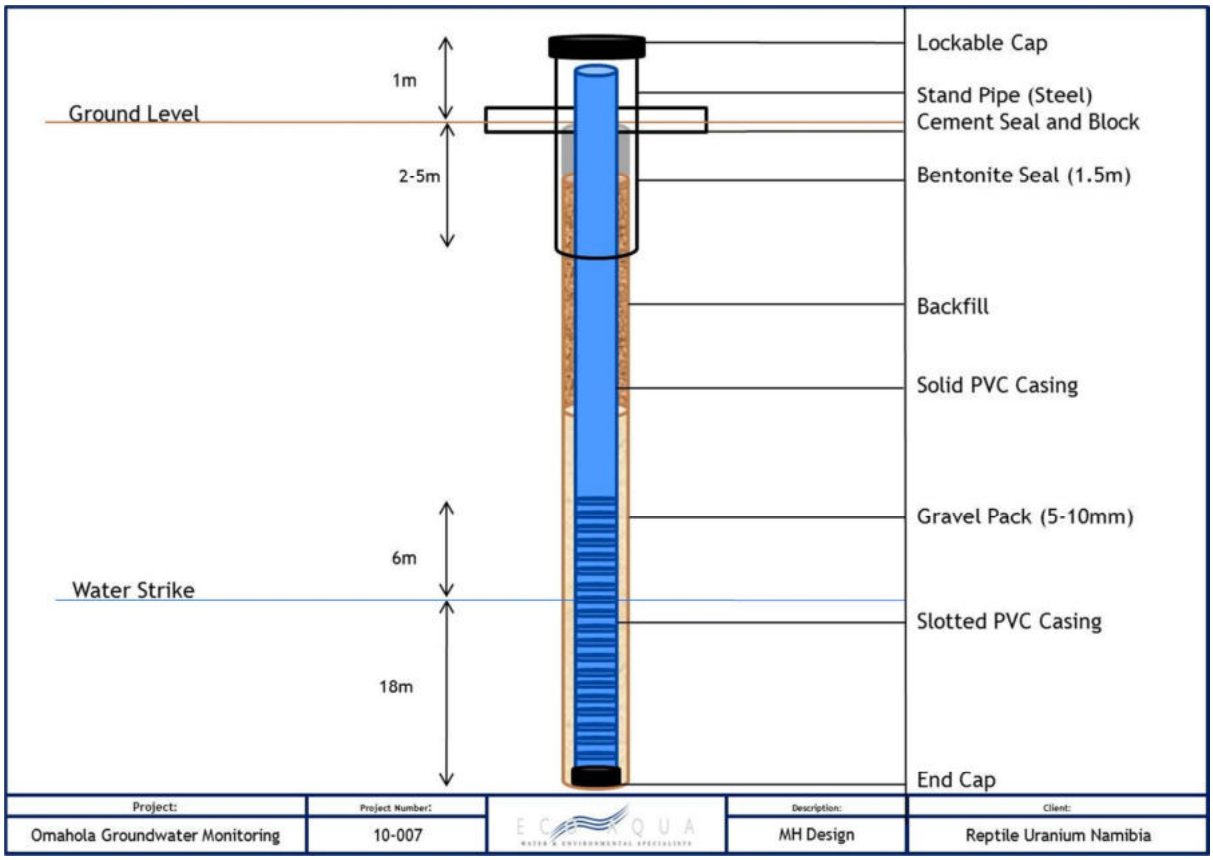

Figure 6: Monitoring Hole Design

3.3 Sampling Procedure and Schedule

The methodology implemented in the collection and preservation of samples from the groundwater monitoring holes is critical to the reliability of the analysis. Samples were taken and preserved on site in order to ensure the samples are maintained in a condition representative of the *in-situ* state. The sampling campaign is conducted in accordance with international standards.

Each monitoring well was purged to the equivalent of 3 well volumes with a 3" Grundfos submersible pump. Once the purging was complete, a 1 (one) litre Teflon bailer was used to sample 3 (three) litres of representative sample that were stored in 6 (six) 500ml plastic water sample bottles. Each of the samples was labelled accordingly and placed in a cooler.

Sampling for standard environmental analysis is scheduled to take place on a biannual basis. Radionuclide sampling will be completed once for the baseline report, and thereafter a more regular schedule developed once actual workings commence on site. The first sampling campaign was completed in August 2010.

3.4 Laboratory Analysis

Groundwater samples were taken for 2 (two) sets of analyses. Standard environmental analysis was completed at M&L Laboratory Services in South Africa. A list of the determinants analysed for is provided in Table 1. Radionuclide analysis was completed at ANSTO in Australia (Table 2). Methods for analyses are provided in Appendix B.

Table 1: Environmental Analysis conducted by M&L Laboratory Services

Determinants	
Suspended Solids	Chloride
TDS	Fluoride
Calcium	Nitrate
Magnesium	Sulfate
Sodium	Total Alkalinity
Potassium	Metals by ICP OES (Mn, U, Fe, Si, As, Al)

Table 2: Radionuclide Analysis conducted ANSTO

RADIONUCLIDES	
^{238}U Uranium	^{235}U Uranium
^{234}U Uranium	^{227}Th Thorium
^{230}Th Thorium	^{223}Ra Radium
^{226}Ra Radium	^{232}Th Thorium
^{210}Po Polonium	^{228}Th Thorium
^{210}Pb Lead	^{224}Ra Radium

Chain of Custody was assigned to all samples. Groundwater samples provided to M&L Laboratories were couriered overnight. Groundwater samples provided to ANSTO were

filtered using a 10 (ten) micron Geotech filter. 2 (two) millilitres of concentrated nitric acid were added to each of the samples. Reptile Uranium Namibia managed the delivery of the samples to ANSTO.

3.5 Namibian Water Quality Guidelines

Water Act No.54 of 1956

The Water Act No.54 of 1956 (Appendix B) is considered the principle document although the Act has been repealed due to the Water Resources Management Act No.24 of 2004 (currently being reviewed and revised with possible implementation in 2011). The Government of the Republic of Namibia decided that until a suitable study had been conducted, the guidelines stipulated in the Water Act No.54 of 1956 would remain valid (Article 140 of Act 1 of 1990).

The guidelines for drinking water are not standards as no publication in the Government Gazette of Namibia exists to that effect. The guidelines were adopted under the Cabinet of the Transitional Government for National Unity (461/85) and took effect from 1 April 1988.

For practical purposes the approved drinking water guidelines have been divided into 3 (three) basic groups of determinants: Table 1: Determinants with aesthetic/physical implications; Table 2: Inorganic determinants; and Table 3: Bacteriological determinants.

The water is classified into groups (A-D) according to the determinants in Tables. The groups are defined as follows:

- Group A: Water with an excellent quality.
- Group B: Water with an acceptable quality.
- Group C: Water with low health risk.
- Group D: Water with a high health risk, not suitable for human consumption.

The overall quality group into which a water is classified is determined by the determinant that complies the least with the guidelines for the quality of drinking water.

4. Results and Conclusion

4.1 Standard Environmental Analysis

Analysis of water samples from the hydrocensus investigation indicate a groundwater quality characterised by high salinities. Total dissolved solids (TDS) ranges from 7056 mg/l through to 43508 mg/l. The groundwater is predominantly a Sodium-Chloride water type (Figures 7-12). The standard environmental analysis results are provided in Table 2. According to the Namibia Water Quality Guidelines, the Omahola Project water is unsuitable for human consumption. The standard environmental analysis results for INCA are provided in Table 3 and the standard environmental analysis results for Tubas Red Sand are provided in Table 4.

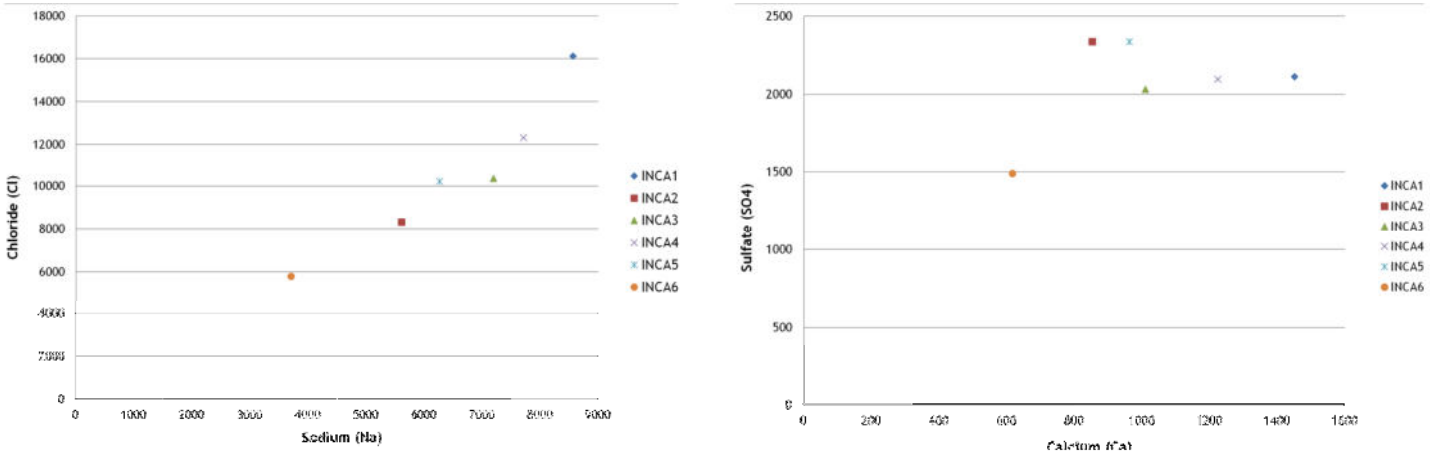

Figure 7 : Scatter plot for INCA Na-Cl and Ca-SO_4 (units: mg/l)

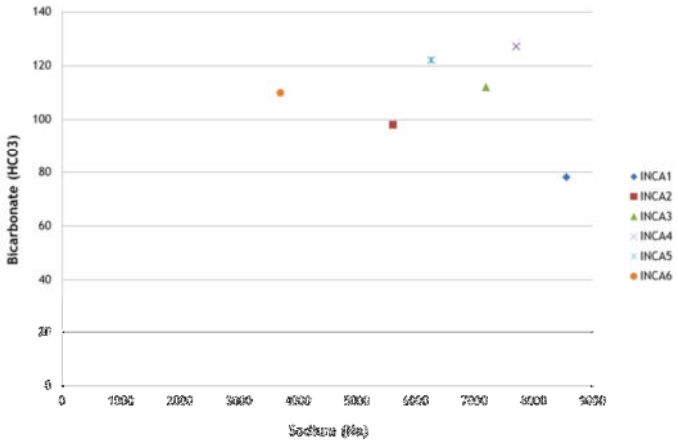

Figure 8: Scatter plot for INCA Na-HCO_3 (units: mg/l)

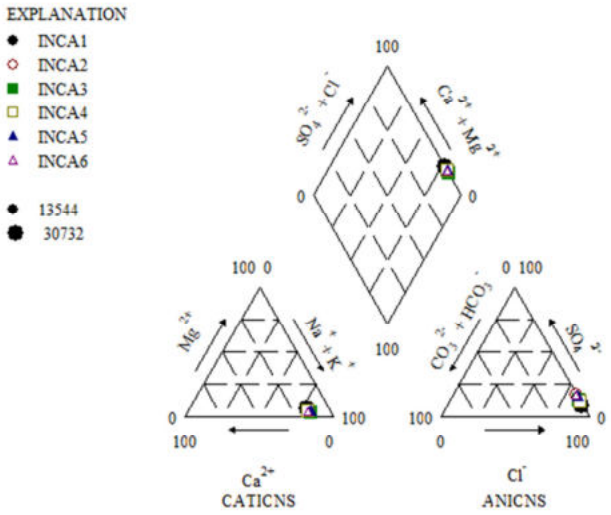

Figure 9: Piper Diagram for INCA

Table 3: Standard Environmental Results for INCA

(Group A and Group D represent Namibian Water Quality Guidelines)

SAMPLE	INCW1	INCW2	INCW3	INCW4	INCW5	INCW6	Group A	Group D
pH Value @ 21°C	7.4	7.4	7.1	7.6	8.1	8		
Conductivity mS/m @ 25°C	4222	2980	3512	3191	3493	2213	150	400
Total Dissolved Solids	30732	18516	22150	24492	21984	13544	500	500
Calcium, Ca	1451	853	1010	1224	963	617	150	400
Magnesium, Mg	363	116	139	187	122	105	70	200
Sodium, Na	8565	5612	7196	7713	6267	3707	100	800
Potassium, K	163	97	123	157	110	107	200	800
Total Alkalinity as $CaCO_3$	64	80	92	104	100	90	-	-
P Alk as $CaCO_3$	Nil	Nil	Nil	Nil	Nil	Nil	-	-
Bicarbonate, HCO_3	78	98	112	127	122	110	-	-
Carbonate, CO_3	Nil	Nil	Nil	Nil	Nil	Nil	-	-
Chloride, Cl	16120	8313	10355	12315	10210	5785	250	1200
Sulfate, SO_4	2112	2336	2032	2096	2336	1488	200	1200
Nitrate, NO_3	282	172	191	373	180	188	-	-
Nitrate as N	64	39	43	84	41	42	10	40
Fluoride, F	1.3	1.8	1.7	1.6	1.6	1.2	1.5	3
Total Suspended Solids	374	215	114	843	173	532	25	25
Sum of Cations meq/ℓ	479.005	298.708	378.003	415.988	333.515	203.415	-	-
Sum of Anions meq/ℓ	504.452	287.53	339.326	399.1	341.543	199.011	-	-
% Error	-2.587	1.907	5.392	2.072	-1.189	1.094	-	-
Arsenic, As	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	0.1	0.1
Aluminium, Al	<0.009	0.38	<0.009	0.66	0.17	0.62	0.15	0.15
Manganese, Mn	<0.001	<0.001	<0.001	0.21	0.034	0.21	0.05	2
Iron, Fe	0.53	0.61	0.52	1.2	1.2	1.4	0.05	2
Silicon, Si	6	8.4	11.8	10.7	5.9	7.6	-	-
Uranium, U	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	1	8

The results are expressed in mg/l where applicable.

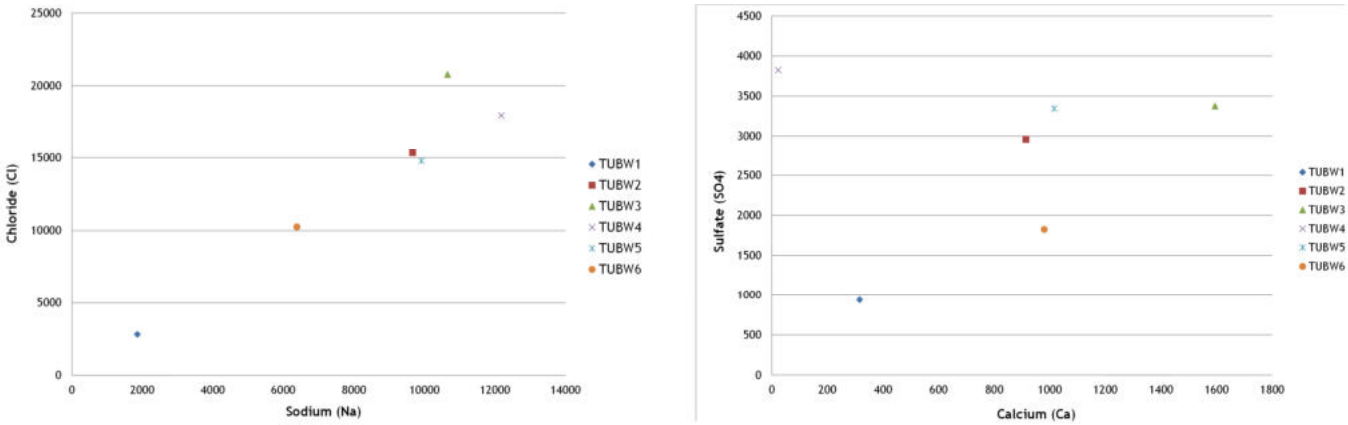

Figure 10: Scatter plot for Tubas Red Sand Na-Cl and Ca-SO_4 (units: mg/l)

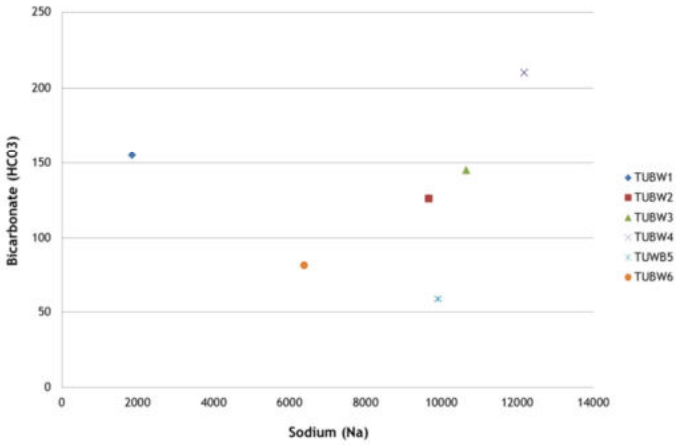

Figure 11: Scatter plot for Tubas Red Sand Na-HCO_3 (units: mg/l)

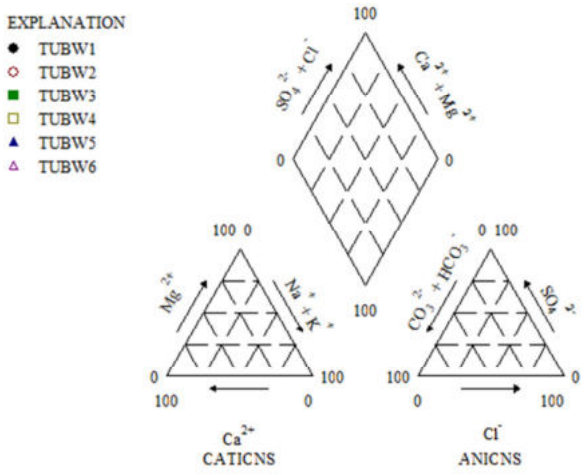

Figure 12: Piper Diagram for Tubas Red Sand

Table 4: Standard Environmental Results for Tubas Red Sand

(Group A and Group D represent Namibian Water Quality Guidelines)

SAMPLE	TUBW1	TUBW2	TUBW3	TUBW4	TUBW5	TUBW6	Group A	Group D
pH Value @ 21°C	8	7.8	7.6	7.3	7.8	7.7		
Conductivity mS/m @ 25°C	1188	5127	6929	6133	5171	3888	150	400
Total Dissolved Solids	7056	32488	43508	38868	32012	31800	500	500
Calcium, Ca	316	914	1594	23	1016	980	150	400
Magnesium, Mg	57	124	548	12	172	246	70	200
Sodium,Na	1860	9665	10660	12183	9918	6383	100	800
Potassium, K	64	116	618	10.7	316	163	200	800
Total Alkalinity as $CaCO_3$	127	103	119	172	48	67	-	-
P Alk as $CaCO_3$	Nil	Nil	Nil	Nil	Nil	Nil	-	-
Bicarbonate, HCO_3	155	126	145	210	59	82	-	-
Carbonate, CO_3	Nil	Nil	Nil	Nil	Nil	Nil	-	-
Chloride, Cl	2825	15335	20780	17950	14760	10250	250	1200
Sulfate, SO_4	936	2960	3376	3824	3344	1824	200	1200
Nitrate, NO_3	104	321	298	429	283	121	-	-
Nitrate as N	23	73	67.3	96.9	63.9	27.3	10	40
Fluoride, F	1.5	1.9	2.1	2.1	1.6	2.5	1.5	3
Total Suspended Solids	843	269	5866	44	2630	167	25	25
Sum of Cations meq/ℓ	103.003	479.201	604.127	532.369	504.36	350.963	-	-
Sum of Anions meq/ℓ	103.446	501.41	663.579	596.273	491.462	330.448	-	-
% Error	-0.215	-2.265	-4.69	-5.662	1.295	3.011	-	-
Arsenic, As	<0.02	<0.02	<0.02	<0.02	0.02	0.02	0.1	0.1
Aluminium, Al	0.38	<0.009	<0.009	0.031	4.7	<0.009	0.15	0.15
Manganese, Mn	0.021	<0.001	0.15	<0.001	0.17	<0.001	0.05	2
Iron, Fe	0.85	0.45	<0.001	0.29	3.3	0.56	0.05	2
Silicon, Si	4.9	3.3	10.4	<0.007	13.5	9.7	-	-
Uranium, U	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	1	8

The results are expressed in mg/l where applicable.

Elevated nitrate levels are evident on most samples. According to various studies, under certain natural conditions, significant loss of nitrogen from the soil zone may occur in certain climatic regions. Various factors are involved in the process, and it is accepted that these are required to operate in unison in order for the elevated nitrate levels to occur. The specific factors include the nature and thickness of surface deposits, rainfall distribution, depth to the groundwater level and the presence of nitrogen-fixing vegetation amongst others. Natural occurrences such as droughts and fires lead to nitrate leaching beyond the root zone, particularly during subsequent heavy rainfall events (Tredoux *et al, 2009)*.

4.2 Radionuclide Analysis

The radioactivity in all samples is low. U-238 and Ra-226 were the only measurable radionuclides present. Ra-228 was also found in INCW1. The analysis results are presented in Table 5.

The results from the August/September 2010 monitoring serve as baseline values for future the relevant Environmental Impact Assessment (EIA), feasibility studies and permit applications. The data will also serve as the basis for the long term monitoring of groundwater quality as will be set out in the relevant Environmental Management Plan (EMP).

5. References

Tredoux, G., Englebrecht, P., and Israel, S.: Nitrate in Groundwater – Why is it a hazard and how to control it? Water Research Commision, South Africa. August 2009.

Appendix A:

Monitoring Holes – Geological Logs

DRILLING SHEET - Monitoring Holes				Date	19/08/2010
Hole ID	INCW1				
Co-Ordinates	Easting	489204.307		Project	10-007
	Northing	7477751.405			
Hydrogeologist	RUN Representative		Water Strike		
Drilling Method	Percussion Drilling		Strike	Depth	Volume
Drilling Contractor	GPM Drilling		1	78	
Geological Log					
Depth (m)	Geology	Depth (m)	Geology		
0 - 1	Granite	39 - 40	Granite		
1 - 2	Granite	40 - 41	Granite		
2 - 3	Granite	41 - 42	Granite		
3 - 4	Granite	42 - 43	Granite		
4 - 5	Granite	43 - 44	Granite	Depth (m)	Geology
5 - 6	Granite	44 - 45	Granite	78 - 79	Granite
6 - 7	Granite	45 - 46	Granite	79 - 80	Granite
7 - 8	Granite	46 - 47	Granite	80 - 81	Granite
8 - 9	Granite	47 - 48	Quartz-Biotite Gneiss	81 - 82	Granite
9 - 10	Granite	48 - 49	Quartz-Biotite Gneiss	82 - 83	Granite
10 - 11	Granite	49 - 50	Quartz-Biotite Gneiss	83 - 84	Granite
11 - 12	Granite	50 - 51	Quartz-Biotite Gneiss	84 - 85	Granite
12 - 13	Granite	51 - 52	Quartz-Biotite Gneiss	85 - 86	Granite
13 - 14	Granite	52 - 53	Quartz-Biotite Gneiss	86 - 87	Granite
14 - 15	Granite	53 - 54	Granite	87 - 88	Granite
15 - 16	Granite	54 - 55	Granite	88 - 89	Granite
16 - 17	Granite	55 - 56	Granite	89 - 90	Granite
17 - 18	Granite	56 - 57	Granite	90 - 91	Granite
18 - 19	Granite	57 - 58	Quartz-Biotite Gneiss	91 - 92	Granite
19 - 20	Granite	58 - 59	Granite	92 - 93	Granite
20 - 21	Granite	59 - 60	Granite	93 - 94	Granite
21 - 22	Granite	60 - 61	Granite	94 - 95	Granite
22 - 23	Granite	61 - 62	Granite	95 - 96	Granite
23 - 24	Granite	62 - 63	Granite		
24 - 25	Granite	63 - 64	Granite		
25 - 26	Granite	64 - 65	Granite		
26 - 27	Granite	65 - 66	Granite		
27 - 28	Granite	66 - 67	Granite		
28 - 29	Quartz-Biotite Gneiss	67 - 68	Granite		
29 - 30	Quartz-Biotite Gneiss	68 - 69	Granite		
30 - 31	Quartz-Biotite Gneiss	69 - 70	Granite		
31 - 32	Granite	70 - 71	Granite		
32 - 33	Quartz-Biotite Gneiss	71 - 72	Granite		
33 - 34	Quartz-Biotite Gneiss	72 - 73	Granite		
34 - 35	Quartz-Biotite Gneiss	73 - 74	Granite		
35 - 36	Quartz-Biotite Gneiss	74 - 75	Granite		
36 - 37	Granite	75 - 76	Granite		
37 - 38	Granite	76 - 77	Granite		
38 - 39	Granite	77 - 78	Granite		

DRILLING SHEET - Monitoring Holes				Date	19/08/2010
Hole ID	INCW2				
Co-Ordinates	Easting	488454.595		Project	10-007
	Northing	7476604.97			
Hydrogeologist	RUN Representative		Water Strike		
Drilling Method	Percussion Drilling		Strike	Depth	Volume
Drilling Contractor	GPM Drilling		1	36	
Geological Log					
Depth (m)	Geology	Depth (m)	Geology		
0 - 1	Granite	39 - 40	Quartz-Biotite Gneiss		
1 - 2	Granite	40 - 41	Quartz-Biotite Gneiss		
2 - 3	Granite	41 - 42	Quartz-Biotite Gneiss		
3 - 4	Granite	42 - 43	Quartz-Biotite Gneiss		
4 - 5	Granite	43 - 44	Quartz-Biotite Gneiss	Depth (m)	Geology
5 - 6	Granite	44 - 45	Quartz-Biotite Gneiss		
6 - 7	Granite	45 - 46	Quartz-Biotite Gneiss		
7 - 8	Granite	46 - 47	Quartz-Biotite Gneiss		
8 - 9	Granite	47 - 48	Quartz-Biotite Gneiss		
9 - 10	Granite	48 - 49	Quartz-Biotite Gneiss		
10 - 11	Granite	49 - 50	Quartz-Biotite Gneiss		
11 - 12	Granite	50 - 51	Quartz-Biotite Gneiss		
12 - 13	Granite	51 - 52	Quartz-Biotite Gneiss		
13 - 14	Granite	52 - 53	Quartz-Biotite Gneiss		
14 - 15	Granite	53 - 54	Quartz-Biotite Gneiss		
15 - 16	Granite				
16 - 17	Granite				
17 - 18	Granite				
18 - 19	Granite				
19 - 20	Granite				
20 - 21	Granite				
21 - 22	Granite				
22 - 23	Granite				
23 - 24	Granite				
24 - 25	Granite				
25 - 26	Quartz-Biotite Gneiss				
26 - 27	Quartz-Biotite Gneiss				
27 - 28	Quartz-Biotite Gneiss				
28 - 29	Quartz-Biotite Gneiss				
29 - 30	Quartz-Biotite Gneiss				
30 - 31	Quartz-Biotite Gneiss				
31 - 32	Quartz-Biotite Gneiss				
32 - 33	Quartz-Biotite Gneiss				
33 - 34	Granite				
34 - 35	Granite				
35 - 36	Granite				
36 - 37	Granite				
37 - 38	Quartz-Biotite Gneiss				
38 - 39	Quartz-Biotite Gneiss				

DRILLING SHEET - Monitoring Holes				Date	19/08/2010
Hole ID	INCW3				
Co-Ordinates	Easting	489005.381		Project	10-007
	Northing	7476429.069			

Hydrogeologist	RUN Representative
Drilling Method	Percussion Drilling
Drilling Contractor	GPM Drilling

Water Strike		
Strike	Depth	Volume
1	42	

Geological Log			
Depth (m)	Geology	Depth (m)	Geology
0 - 1	Gypsum	39 - 40	Granite
1 - 2	Granite	40 - 41	Marble
2 - 3	Granite	41 - 42	Marble
3 - 4	Granite	42 - 43	Marble
4 - 5	Granite	43 - 44	Marble
5 - 6	Granite	44 - 45	Marble
6 - 7	Granite	45 - 46	Marble
7 - 8	Granite	46 - 47	Marble
8 - 9	Granite	47 - 48	Marble
9 - 10	Granite	48 - 49	Marble
10 - 11	Granite	49 - 50	Marble
11 - 12	Granite	50 - 51	Marble
12 - 13	Granite	51 - 52	Marble
13 - 14	Granite	52 - 53	Marble
14 - 15	Granite	53 - 54	Marble
15 - 16	Granite	54 - 55	Marble
16 - 17	Granite	55 - 56	Marble
17 - 18	Quartz-Biotite Gneiss	56 - 57	Marble
18 - 19	Quartz-Biotite Gneiss	57 - 58	Marble
19 - 20	Quartz-Biotite Gneiss	58 - 59	Marble
20 - 21	Quartz-Biotite Gneiss	59 - 60	Marble
21 - 22	Quartz-Biotite Gneiss		
22 - 23	Quartz-Biotite Gneiss		
23 - 24	Quartz-Biotite Gneiss		
24 - 25	Quartz-Biotite Gneiss		
25 - 26	Quartz-Biotite Gneiss		
26 - 27	Quartz-Biotite Gneiss		
27 - 28	Quartz-Biotite Gneiss		
28 - 29	Granite		
29 - 30	Granite		
30 - 31	Granite		
31 - 32	Granite		
32 - 33	Granite		
33 - 34	Granite		
34 - 35	Granite		
35 - 36	Granite		
36 - 37	Granite		
37 - 38	Granite		
38 - 39	Granite		

Depth (m)	Geology	

DRILLING SHEET - Monitoring Holes				Date	19/08/2010
Hole ID	INCW4				
Co-Ordinates	Easting	488631.08		Project	10-007
	Northing	7475600.884			
Hydrogeologist	RUN Representative		Water Strike		
Drilling Method	Percussion Drilling		Strike	Depth	Volume
Drilling Contractor	GPM Drilling		1	36	
Geological Log					
Depth (m)	Geology	Depth (m)	Geology	Depth (m)	Geology
0 - 1	Granite	39 - 40	Quartz-Biotite Gneiss		
1 - 2	Granite	40 - 41	Quartz-Biotite Gneiss		
2 - 3	Granite	41 - 42	Quartz-Biotite Gneiss		
3 - 4	Granite	42 - 43	Quartz-Biotite Gneiss		
4 - 5	Granite	43 - 44	Quartz-Biotite Gneiss		
5 - 6	Granite	44 - 45	Quartz-Biotite Gneiss		
6 - 7	Granite	45 - 46	Quartz-Biotite Gneiss		
7 - 8	Granite	46 - 47	Quartz-Biotite Gneiss		
8 - 9	Granite	47 - 48	Granite		
9 - 10	Granite	48 - 49	Granite		
10 - 11	Granite	49 - 50	Granite		
11 - 12	Granite	50 - 51	Quartz-Biotite Gneiss		
12 - 13	Granite	51 - 52	Quartz-Biotite Gneiss		
13 - 14	Granite	52 - 53	Quartz-Biotite Gneiss		
14 - 15	Granite	53 - 54	Quartz-Biotite Gneiss		
15 - 16	Granite				
16 - 17	Granite				
17 - 18	Granite				
18 - 19	Granite				
19 - 20	Granite				
20 - 21	Quartz-Biotite Gneiss				
21 - 22	Quartz-Biotite Gneiss				
22 - 23	Quartz-Biotite Gneiss				
23 - 24	Quartz-Biotite Gneiss				
24 - 25	Quartz-Biotite Gneiss				
25 - 26	Quartz-Biotite Gneiss				
26 - 27	Quartz-Biotite Gneiss				
27 - 28	Granite				
28 - 29	Granite				
29 - 30	Quartz-Biotite Gneiss				
30 - 31	Quartz-Biotite Gneiss				
31 - 32	Quartz-Biotite Gneiss				
32 - 33	Quartz-Biotite Gneiss				
33 - 34	Quartz-Biotite Gneiss				
34 - 35	Quartz-Biotite Gneiss				
35 - 36	Quartz-Biotite Gneiss				
36 - 37	Quartz-Biotite Gneiss				
37 - 38	Quartz-Biotite Gneiss				
38 - 39	Quartz-Biotite Gneiss				

DRILLING SHEET - Monitoring Holes				Date	19/08/2010
Hole ID	INCW5				
Co-Ordinates	Easting	489042		Project	10-007
	Northing	7475887			

Hydrogeologist	RUN Representative	Water Strike		
Drilling Method	Percussion Drilling	Strike	Depth	Volume
Drilling Contractor	GPM Drilling	1	97	

Geological Log			
Depth (m)	Geology	Depth (m)	Geology
0 - 1	Granite	46 - 47	Granite
1 - 2	Granite	47 - 48	Granite
2 - 3	Granite	48 - 49	Granite
3 - 4	Granite	49 - 50	Granite
4 - 5	Granite	50 - 51	Granite
5 - 6	Granite	51 - 52	Granite
6 - 7	Granite	52 - 53	Granite
7 - 8	Granite	53 - 54	Granite
8 - 9	Granite	54 - 55	Granite
9 - 10	Granite	55 - 56	Granite
10 - 11	Granite	56 - 57	Granite
11 - 12	Granite	57 - 58	Granite
12 - 13	Granite	58 - 59	Granite
13 - 14	Granite	59 - 60	Granite
14 - 15	Granite	60 - 61	Granite
15 - 16	Granite	61 - 62	Granite
16 - 17	Granite	62 - 63	Granite
17 - 18	Granite	63 - 64	Granite
18 - 19	Granite	64 - 65	Granite
19 - 20	Granite	65 - 66	Granite
20 - 21	Granite	66 - 67	Granite
21 - 22	Granite	67 - 68	Granite
22 - 23	Granite	68 - 69	Granite
23 - 24	Granite	69 - 70	Granite
24 - 25	Granite	70 - 71	Granite
25 - 26	Granite	71 - 72	Granite
26 - 27	Granite	72 - 73	Granite
27 - 28	Granite	73 - 74	Granite
28 - 29	Granite	74 - 75	Granite
29 - 30	Granite	75 - 76	Granite
30 - 31	Granite	76 - 77	Granite
31 - 32	Granite	77 - 78	Granite
32 - 33	Granite	78 - 79	Granite
33 - 34	Granite	79 - 80	Granite
34 - 35	Granite	80 - 81	Granite
35 - 36	Granite	81 - 82	Granite
36 - 37	Granite	82 - 83	Granite
37 - 38	Granite	83 - 84	Granite
38 - 39	Granite	84 - 85	Granite
39 - 40	Granite	85 - 86	Granite
40 - 41	Granite	86 - 87	Granite
41 - 42	Granite	87 - 88	Granite
42 - 43	Granite	88 - 89	Granite
43 - 44	Granite	89 - 90	Granite
44 - 45	Granite	90 - 91	Granite
45 - 46	Granite	91 - 92	Granite

Depth (m)	Geology
92 - 93	Granite
93 - 94	Granite
94 - 95	Granite
95 - 96	Granite
96 - 97	Granite
97 - 98	Granite
98 - 99	Granite
99 - 100	Granite
100 - 101	Granite
101 - 102	Granite
102 - 103	Granite
103 - 104	Granite
104 - 105	Granite
105 - 106	Granite
106 - 107	Granite
107 - 108	Granite
108 - 109	Granite
109 - 110	Granite
110 - 111	Granite
111 - 112	Granite
112 - 113	Granite
113 - 114	Granite
114 - 115	Granite
115 - 116	Granite
116 - 117	Granite
117 - 118	Granite

DRILLING SHEET - Monitoring Holes				Date	19/08/2010
Hole ID	INCW6				
Co-Ordinates	Easting	496398.219		Project	10-007
	Northing	7481850.194			
Hydrogeologist	RUN Representative			Water Strike	
Drilling Method	Percussion Drilling			Strike	Depth	Volume
Drilling Contractor	GPM Drilling			1	60	
Geological Log						
Depth (m)	Geology	Depth (m)	Geology	Depth (m)	Geology	
0 - 1	Gypsum	39 - 40	Hematite Quartz Rock			
1 - 2	Calcrete	40 - 41	Hematite Quartz Rock			
2 - 3	Calcrete	41 - 42	Hematite Quartz Rock			
3 - 4	Calcrete	42 - 43	Hematite Quartz Rock			
4 - 5	Calcrete	43 - 44	Hematite Quartz Rock			
5 - 6	Calcrete	44 - 45	Hematite Quartz Rock			
6 - 7	Calcrete	45 - 46	Hematite Quartz Rock			
7 - 8	Calcrete	46 - 47	Biotite Quartz Rock			
8 - 9	Calcrete	47 - 48	Biotite Quartz Rock			
9 - 10	Calcrete	48 - 49	Biotite Quartz Rock			
10 - 11	Calcrete	49 - 50	Biotite Quartz Rock			
11 - 12	Calcrete	50 - 51	Biotite Quartz Rock			
12 - 13	Calcrete	51 - 52	Biotite Quartz Rock			
13 - 14	Calcrete	52 - 53	Biotite Quartz Rock			
14 - 15	Calcrete	53 - 54	Biotite Quartz Rock			
15 - 16	Calcrete	54 - 55	Biotite Quartz Rock			
16 - 17	Calcrete	55 - 56	Biotite Quartz Rock			
17 - 18	Calcrete	56 - 57	Biotite Quartz Rock			
18 - 19	Hematite Quartz Rock	57 - 58	Biotite Quartz Rock			
19 - 20	Hematite Quartz Rock	58 - 59	Biotite Quartz Rock			
20 - 21	Hematite Quartz Rock	59 - 60	Biotite Quartz Rock			
21 - 22	Hematite Quartz Rock	60 - 61	Biotite Quartz Rock			
22 - 23	Hematite Quartz Rock	61 - 62	Biotite Quartz Rock			
23 - 24	Hematite Quartz Rock	62 - 63	Biotite Quartz Rock			
24 - 25	Hematite Quartz Rock	63 - 64	Biotite Quartz Rock			
25 - 26	Hematite Quartz Rock	64 - 65	Biotite Quartz Rock			
26 - 27	Hematite Quartz Rock	65 - 66	Biotite Quartz Rock			
27 - 28	Hematite Quartz Rock	66 - 67	Biotite Quartz Rock			
28 - 29	Hematite Quartz Rock	67 - 68	Biotite Quartz Rock			
29 - 30	Hematite Quartz Rock	68 - 69	Biotite Quartz Rock			
30 - 31	Hematite Quartz Rock	69 - 70	Biotite Quartz Rock			
31 - 32	Hematite Quartz Rock	70 - 71	Biotite Quartz Rock			
32 - 33	Hematite Quartz Rock	71 - 72	Biotite Quartz Rock			
33 - 34	Hematite Quartz Rock	72 - 73	Biotite Quartz Rock			
34 - 35	Hematite Quartz Rock	73 - 74	Biotite Quartz Rock			
35 - 36	Hematite Quartz Rock	74 - 75	Biotite Quartz Rock			
36 - 37	Hematite Quartz Rock	75 - 76	Biotite Quartz Rock			
37 - 38	Hematite Quartz Rock	76 - 77	Biotite Quartz Rock			
38 - 39	Hematite Quartz Rock	77 - 78	Biotite Quartz Rock			

DRILLING SHEET - Monitoring Holes				Date	19/08/2010
Hole ID	TUBW1 (TUBR003)				
Co-Ordinates	Easting	504000		Project	10-007
	Northing	7471500			

Hydrogeologist	RUN Representative
Drilling Method	Percussion Drilling
Drilling Contractor	GPM Drilling

Water Strike		
Strike	Depth	Volume
1	60	
2	90	

Geological Log

Depth (m)	Geology	Depth (m)	Geology
0 - 1	Gravel	42 - 43	Calcrete
1 - 2	Gravel	43 - 44	Calcrete
2 - 3	Gravel	44 - 45	Calcrete
3 - 4	Gravel	45 - 46	Calcrete
4 - 5	Gravel	46 - 47	Calcrete
5 - 6	Gravel	47 - 48	Calcrete
6 - 7	Calcrete	48 - 49	Calcrete
7 - 8	Calcrete	49 - 50	Calcrete
8 - 9	Calcrete	50 - 51	Calcrete
9 - 10	Calcrete	51 - 52	Calcrete
10 - 11	Calcrete	52 - 53	Calcrete
11 - 12	Calcrete	53 - 54	Calcrete
12 - 13	Calcrete	54 - 55	Calcrete
13 - 14	Calcrete	55 - 56	Calcrete
14 - 15	Calcrete	56 - 57	Calcrete
15 - 16	Calcrete	57 - 58	Calcrete
16 - 17	Calcrete	58 - 59	Calcrete
17 - 18	Calcrete	59 - 60	Calcrete
18 - 19	Calcrete	60 - 61	Calcrete
19 - 20	Calcrete	61 - 62	Calcrete
20 - 21	Calcrete	62 - 63	Calcrete
21 - 22	Calcrete	63 - 64	Calcrete
22 - 23	Calcrete	64 - 65	Calcrete
23 - 24	Calcrete	65 - 66	Calcrete
24 - 25	Calcrete	66 - 67	Gravel
25 - 26	Calcrete	67 - 68	Gravel
26 - 27	Calcrete	68 - 69	Gravel
27 - 28	Calcrete	69 - 70	Gravel
28 - 29	Calcrete	70 - 71	Gravel
29 - 30	Calcrete	71 - 72	Gravel
30 - 31	Calcrete	72 - 73	Gravel
31 - 32	Calcrete	73 - 74	Gravel
32 - 33	Calcrete	74 - 75	Gravel
33 - 34	Calcrete	75 - 76	Gravel
34 - 35	Calcrete	76 - 77	Gravel
35 - 36	Calcrete	77 - 78	Gravel
36 - 37	Calcrete	78 - 79	Gravel
37 - 38	Calcrete	79 - 80	Gravel
38 - 39	Calcrete	80 - 81	Gravel
39 - 40	Calcrete	81 - 82	Gravel
40 - 41	Calcrete	82 - 83	Gravel
41 - 42	Calcrete	83 - 84	Gravel

Depth (m)	Geology
84 - 85	Gravel
85 - 86	Gravel
86 - 87	Gravel
87 - 88	Gravel
88 - 89	Gravel
89 - 90	Gravel
90 - 91	Gravel
91 - 92	Gravel
92 - 93	Gravel
93 - 94	Gravel
94 - 95	Gravel
95 - 96	Gravel
96 - 97	Gravel
97 - 98	Gravel
98 - 99	Gravel
99 - 100	Gravel
100 - 101	Gravel
101 - 102	Gravel
102 - 103	Gravel
103 - 104	Gravel
104 - 105	Gravel
105 - 106	Gravel
106 - 107	Gravel
107 - 108	Gravel
108 - 109	Gravel
109 - 110	Gravel
110 - 111	Gravel
111 - 112	Gravel
112 - 113	Gravel
113 - 114	Gravel
114 - 115	Gravel

DRILLING SHEET - Monitoring Holes				Date	19/08/2010
Hole ID	TUBW2 (TUBR1055)				
Co-Ordinates	Easting	499200		Project	10-007
	Northing	7468048			
Hydrogeologist	RUN Representative		Water Strike		
Drilling Method	Percussion Drilling		Strike	Depth	Volume
Drilling Contractor	GPM Drilling		1	36	
			2	90	
Geological Log					
Depth (m)	Geology	Depth (m)	Geology	Depth (m)	Geology
0 - 1	Gravel	39 - 40	Gravel		
1 - 2	Gravel	40 - 41	Gravel		
2 - 3	Gravel	41 - 42	Gravel		
3 - 4	Gravel	42 - 43	Gravel		
4 - 5	Gravel	43 - 44	Gravel		
5 - 6	Gravel	44 - 45	Gravel	78 - 79	Gravel
6 - 7	Gravel	45 - 46	Gravel	79 - 80	Gravel
7 - 8	Gravel	46 - 47	Gravel	80 - 81	Gravel
8 - 9	Gravel	47 - 48	Gravel	81 - 82	Gravel
9 - 10	Gravel	48 - 49	Gravel	82 - 83	Gravel
10 - 11	Gravel	49 - 50	Gravel	83 - 84	Gravel
11 - 12	Calcrete	50 - 51	Gravel	84 - 85	Gravel
12 - 13	Gravel	51 - 52	Gravel	85 - 86	Gravel
13 - 14	Calcrete	52 - 53	Gravel	86 - 87	Gravel
14 - 15	Gravel	53 - 54	Gravel	87 - 88	Gravel
15 - 16	Gravel	54 - 55	Gravel	88 - 89	Gravel
16 - 17	Gravel	55 - 56	Gravel	89 - 90	Gravel
17 - 18	Gypcrete	56 - 57	Gravel	90 - 91	Gravel
18 - 19	Gypcrete	57 - 58	Gravel	91 - 92	Gravel
19 - 20	Calcrete	58 - 59	Gravel	92 - 93	Gravel
20 - 21	Gravel	59 - 60	Gravel	93 - 94	Gravel
21 - 22	Gravel	60 - 61	Gravel	94 - 95	Gravel
22 - 23	Gravel	61 - 62	Gravel	95 - 96	Gravel
23 - 24	Gravel	62 - 63	Gravel	96 - 97	Gravel
24 - 25	Gravel	63 - 64	Gravel	97 - 98	Gravel
25 - 26	Gravel	64 - 65	Gravel	98 - 99	Gravel
26 - 27	Gravel	65 - 66	Gravel	99 - 100	Gravel
27 - 28	Gravel	66 - 67	Gravel	100 - 101	Gravel
28 - 29	Gravel	67 - 68	Gravel	101 - 102	Gravel
29 - 30	Gravel	68 - 69	Gravel	102 - 103	Gravel
30 - 31	Gravel	69 - 70	Gravel	103 - 104	Gravel
31 - 32	Gravel	70 - 71	Gravel	104 - 105	Gravel
32 - 33	Gravel	71 - 72	Gravel	105 - 106	Gravel
33 - 34	Gravel	72 - 73	Gravel	106 - 107	Gravel
34 - 35	Gravel	73 - 74	Gravel	107 - 108	Granite
35 - 36	Gravel	74 - 75	Gravel		
36 - 37	Gravel	75 - 76	Gravel		
37 - 38	Gravel	76 - 77	Gravel		
38 - 39	Gravel	77 - 78	Gravel		

DRILLING SHEET - Monitoring Holes				Date	19/08/2010
Hole ID	TUBW3 (TUBR1035)				
Co-Ordinates	Easting	499190		Project	10-007
	Northing	7467043			
Hydrogeologist	RUN Representative		Water Strike		
Drilling Method	Percussion Drilling		Strike	Depth	Volume
Drilling Contractor	GPM Drilling		1	24	
Geological Log					
Depth (m)	Geology	Depth (m)	Geology		
0 - 1	Gravel	39 - 40	Granite		
1 - 2	Gravel	40 - 41	Granite		
2 - 3	Gravel	41 - 42	Granite		
3 - 4	Gravel	42 - 43	Granite		
4 - 5	Red Sand			Depth (m)	Geology
5 - 6	Red Sand				
6 - 7	Red Sand				
7 - 8	Red Sand				
8 - 9	Red Sand				
9 - 10	Red Sand				
10 - 11	Red Sand				
11 - 12	Red Sand				
12 - 13	Red Sand				
13 - 14	Red Sand				
14 - 15	Red Sand				
15 - 16	Red Sand				
16 - 17	Red Sand				
17 - 18	Red Sand				
18 - 19	Red Sand				
19 - 20	Red Sand				
20 - 21	Red Sand				
21 - 22	Red Sand				
22 - 23	Gravel				
23 - 24	Gravel				
24 - 25	Gravel				
25 - 26	Gravel				
26 - 27	Gravel				
27 - 28	Gravel				
28 - 29	Gravel				
29 - 30	Gravel				
30 - 31	Gravel				
31 - 32	Gravel				
32 - 33	Gravel				
33 - 34	Granite				
34 - 35	Granite				
35 - 36	Granite				
36 - 37	Granite				
37 - 38	Granite				
38 - 39	Granite				

DRILLING SHEET - Monitoring Holes				Date	19/08/2010
Hole ID	TUBW4 (TUBR976)				
Co-Ordinates	Easting	499995		Project	10-007
	Northing	7466942			
Hydrogeologist	RUN Representative		Water Strike		
Drilling Method	Percussion Drilling		Strike	Depth	Volume
Drilling Contractor	GPM Drilling		1	24	
Geological Log			2	72	
Depth (m)	Geology	Depth (m)	Geology		
0 - 1	Gravel	39 - 40	Calcrete		
1 - 2	Gravel	40 - 41	Calcrete		
2 - 3	Gravel	41 - 42	Calcrete		
3 - 4	Gravel	42 - 43	Gravel		
4 - 5	Gravel	43 - 44	Gravel	Depth (m)	Geology
5 - 6	Gravel	44 - 45	Gravel		
6 - 7	Red Sand	45 - 46	Gravel		
7 - 8	Red Sand	46 - 47	Calcrete		
8 - 9	Red Sand	47 - 48	Calcrete		
9 - 10	Red Sand	48 - 49	Calcrete		
10 - 11	Red Sand	49 - 50	Gravel		
11 - 12	Red Sand	50 - 51	Gravel		
12 - 13	Gravel	51 - 52	Gravel		
13 - 14	Calcrete	52 - 53	Gravel		
14 - 15	Calcrete	53 - 54	Gravel		
15 - 16	Gravel	54 - 55	Gravel		
16 - 17	Gravel	55 - 56	Gravel		
17 - 18	Gravel	56 - 57	Gravel		
18 - 19	Gravel	57 - 58	Gravel		
19 - 20	Gravel	58 - 59	Gravel		
20 - 21	Gravel	59 - 60	Gravel		
21 - 22	Gravel	60 - 61	Gravel		
22 - 23	Gravel	61 - 62	Gravel		
23 - 24	Gravel	62 - 63	Gravel		
24 - 25	Gravel	63 - 64	Gravel		
25 - 26	Gravel	64 - 65	Gravel		
26 - 27	Gravel	65 - 66	Gravel		
27 - 28	Gravel	66 - 67	Gravel		
28 - 29	Calcrete	67 - 68	Gravel		
29 - 30	Calcrete	68 - 69	Gravel		
30 - 31	Calcrete	69 - 70	Granite		
31 - 32	Calcrete	70 - 71	Granite		
32 - 33	Gravel	71 - 72	Granite		
33 - 34	Gravel				
34 - 35	Gravel				
35 - 36	Gravel				
36 - 37	Gravel				
37 - 38	Calcrete				
38 - 39	Gravel				

DRILLING SHEET - Monitoring Holes				Date	19/08/2010
Hole ID	TUBW5 (TUBR916)				
Co-Ordinates	Easting	502000		Project	10-007
	Northing	7466000			
Hydrogeologist	RUN Representative		Water Strike		
Drilling Method	Percussion Drilling		Strike	Depth	Volume
Drilling Contractor	GPM Drilling		1	36	
Geological Log					
Depth (m)	Geology	Depth (m)	Geology		
0 - 1	Gravel	39 - 40	Gravel		
1 - 2	Gravel	40 - 41	Gravel		
2 - 3	Gravel	41 - 42	Gravel		
3 - 4	Gravel	42 - 43	Gravel		
4 - 5	Gravel	43 - 44	Gravel	Depth (m)	Geology
5 - 6	Gravel	44 - 45	Gravel		
6 - 7	Gravel	45 - 46	Gravel		
7 - 8	Gravel	46 - 47	Gravel		
8 - 9	Gravel	47 - 48	Gravel		
9 - 10	Gravel	48 - 49	Gravel		
10 - 11	Gravel	49 - 50	Gravel		
11 - 12	Gravel	50 - 51	Gravel		
12 - 13	Gravel	51 - 52	Gravel		
13 - 14	Gravel	52 - 53	Gravel		
14 - 15	Gravel	53 - 54	Calcrete		
15 - 16	Gravel	54 - 55	Calcrete		
16 - 17	Gravel	55 - 56	Calcrete		
17 - 18	Gravel	56 - 57	Gravel		
18 - 19	Gravel	57 - 58	Gravel		
19 - 20	Gravel	58 - 59	Granite		
20 - 21	Gravel	59 - 60	Gravel		
21 - 22	Gravel	60 - 61	Gravel		
22 - 23	Gravel	61 - 62	Granite		
23 - 24	Gravel	62 - 63	Granite		
24 - 25	Gravel	63 - 64	Biotite Quartz Rock		
25 - 26	Gravel	64 - 65	Granite		
26 - 27	Gravel	65 - 66	Granite		
27 - 28	Gravel	66 - 67	Granite		
28 - 29	Gravel	67 - 68	Granite		
29 - 30	Gravel	68 - 69	Granite		
30 - 31	Gravel	69 - 70	Granite		
31 - 32	Gravel	70 - 71	Granite		
32 - 33	Gravel	71 - 72	Granite		
33 - 34	Gravel				
34 - 35	Gravel				
35 - 36	Gravel				
36 - 37	Gravel				
37 - 38	Gravel				
38 - 39	Gravel				

DRILLING SHEET - Monitoring Holes				Date	19/08/2010
Hole ID	TUBW6				
Co-Ordinates	Easting	485005		Project	10-007
	Northing	7469500			

Hydrogeologist	RUN Representative	Water Strike		
Drilling Method	Percussion Drilling	Strike	Depth	Volume
Drilling Contractor	GPM Drilling	1	32	

Geological Log			
Depth (m)	Geology	Depth (m)	Geology
0 - 1	Gravel	39 - 40	Granite
1 - 2	Gravel	40 - 41	Granite
2 - 3	Red Sand	41 - 42	Granite
3 - 4	Red Sand	42 - 43	Granite
4 - 5	Red Sand	43 - 44	Granite
5 - 6	Red Sand	44 - 45	Granite
6 - 7	Red Sand	45 - 46	Granite
7 - 8	Calcrete	46 - 47	Granite
8 - 9	Calcrete	47 - 48	Granite
9 - 10	Calcrete		
10 - 11	Calcrete		
11 - 12	Granite		
12 - 13	Granite		
13 - 14	Granite		
14 - 15	Granite		
15 - 16	Granite		
16 - 17	Granite		
17 - 18	Granite		
18 - 19	Granite		
19 - 20	Granite		
20 - 21	Granite		
21 - 22	Granite		
22 - 23	Granite		
23 - 24	Granite		
24 - 25	Granite		
25 - 26	Granite		
26 - 27	Granite		
27 - 28	Granite		
28 - 29	Granite		
29 - 30	Granite		
30 - 31	Granite		
31 - 32	Granite		
32 - 33	Granite		
33 - 34	Granite		
34 - 35	Granite		
35 - 36	Granite		
36 - 37	Granite		
37 - 38	Granite		
38 - 39	Granite		

Depth (m)	Geology

Appendix B:

Laboratory Analysis Methods and Results

P.O. Box 82124,
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Registration Number 1974/001476/07 Vat Number 4780103505

M and L Laboratory Services (Pty) Ltd

Consulting Industrial Chemists, Analysts & Samplers
CONFIDENTIAL

Ref.No. 10/03948L

Issued at Johannesburg

Date 30.09.2010

AA/cvs

COMPANY NAME	: ECO AQUA CONSULTING CC
ADDRESS	: P.O BOX 8291, SWAKOPMUND, NAMIBIA
SUBJECT	: ANALYSIS OF 12 SAMPLES OF WATER
MARKED	: AS BELOW
INSTRUCTED BY	: MARK STANTON
ORDER NO.	: COD
DATE RECEIVED	: 2010.09.15
DATE ANALYSED	: 2010.09.17
LAB NO(S)	: E69257 – E69268

Analysis on an as received basis:

Lab No:	69257	69258	69259	69260
SAMPLE MARKS	SAMPLE 1	SAMPLE 2	SAMPLE 3	SAMPLE 4
pH Value @ 21°C	7.1	7.4	7.4	7.6
Conductivity mS/m @ 25°C	3512	4222	2980	3191
Total Dissolved Solids	22150	30732	18516	24492
Calcium, Ca	1010	1451	853	1224
Magnesium, Mg	139	363	116	187
Sodium, Na	7196	8565	5612	7713
Potassium, K	123	163	97	157
Total Alkalinity as $CaCO_3$	92	64	80	104
P Alk as $CaCO_3$	Nil	Nil	Nil	Nil
Bicarbonate, HCO_3	112	78	98	127
Carbonate, CO_3	Nil	Nil	Nil	Nil
Chloride, Cl	10355	16120	8313	12315
Sulfate, SO_4	2032	2112	2336	2096
Nitrate, NO_3	191	282	172	373
Nitrate as N	43	64	39	84
Fluoride, F	1.7	1.3	1.8	1.6
Total Suspended Solids	114	374	215	843
Sum of Cations meq/ℓ	378.003	479.005	298.708	415.988
Sum of Anions meq/ℓ	339.326	504.452	287.530	399.100
% Error	5.392	-2.587	1.907	2.072

The results are expressed in mg/l where applicable.

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Date 30.09.2010

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Analysis on an as received basis:

Lab No:	69261	69262	69263	69264
SAMPLE MARKS	SAMPLE 5	SAMPLE 6	SAMPLE 7	SAMPLE 8
pH Value @ 21°C	8.1	8.0	8.0	7.8
Conductivity mS/m @ 25°C	3493	2213	1188	5127
Total Dissolved Solids	21984	13544	7056	32488
Calcium, Ca	963	617	316	914
Magnesium, Mg	122	105	57	124
Sodium,Na	6267	3707	1860	9665
Potassium, K	110	107	64	116
Total Alkalinity as $CaCO_3$	100	90	127	103
P Alk as $CaCO_3$	Nil	Nil	Nil	Nil
Bicarbonate, HCO_3	122	110	155	126
Carbonate, CO_3	Nil	Nil	Nil	Nil
Chloride, Cl	10210	5785	2825	15335
Sulfate, SO_4	2336	1488	936	2960
Nitrate, NO_3	180	188	104	321
Nitrate as N	41	42	23	73
Fluoride, F	1.6	1.2	1.5	1.9
Total Suspended Solids	173	532	843	269
Sum of Cations meq/ℓ	333.515	203.415	103.003	479.201
Sum of Anions meq/ℓ	341.543	199.011	103.446	501.410
% Error	-1.189	1.094	-0.215	-2.265

The results are expressed in mg/l where applicable.

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Analysis on an as received basis:

Lab No:	69265	69266	69267	69268
SAMPLE MARKS	SAMPLE 9	SAMPLE 10	SAMPLE 11	SAMPLE 12
pH Value @ 21°C	7.6	7.3	7.8	7.7
Conductivity mS/m @ 25°C	6929	6133	5171	3888
Total Dissolved Solids	43508	38868	32012	31800
Calcium, Ca	1594	23	1016	980
Magnesium, Mg	548	12.0	172	246
Sodium, Na	10660	12183	9918	6383
Potassium, K	618	10.7	316	163
Total Alkalinity as $CaCO_3$	119	172	48	67
P Alk as $CaCO_3$	Nil	Nil	Nil	Nil
Bicarbonate,HCO_3	145	210	59	82
Carbonate, CO_3	Nil	Nil	Nil	Nil
Chloride, Cl	20780	17950	14760	10250
Sulfate, SO_4	3376	3824	3344	1824
Nitrate, NO_3	298	429	283	121
Nitrate as N	67.3	96.9	63.9	27.3
Fluoride, F	2.1	2.1	1.6	2.5
Total Suspended Solids	5866	44	2630	167
Sum of Cations meq/ℓ	604.127	532.369	504.360	350.963
Sum of Anions meq/ℓ	663.579	596.273	491.462	330.448
% Error	-4.690	-5.662	1.295	3.011

The results are expressed in mg/l where applicable.

Method reference: A list Appended.

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AA/cvs

COMPANY NAME : ECO AQUA CONSULTING CC
ADDRESS : P.O BOX 8291, SWAKOPMUND, NAMIBIA
SUBJECT : ANALYSIS OF 12 SAMPLES OF WATER
MARKED : AS BELOW
INSTRUCTED BY : MARK STANTON
ORDER NO. : COD
DATE RECEIVED : 2010.09.15
DATE ANALYSED : 2010.09.17
LAB NO(S) : E69257 – E69268

Analysis on an as received basis:

Lab number	E69257	E69258	E69259	E68260
Sample marks	Sample 1	Sample 2	Sample 3	Sample 4
Arsenic, As	0.02	<0.02	<0.02	<0.02
Aluminium, Al	<0.009	<0.009	0.38	0.66
Manganese, Mn	<0.001	<0.001	<0.001	0.21
Iron, Fe	0.52	0.53	0.61	1.2
Silicon, Si	11.8	6.0	8.4	10.7
Uranium, U	<0.004	<0.004	<0.004	<0.004

Lab number	E69261	E69262	E69263	E68264
Sample marks	Sample 5	Sample 6	Sample 7	Sample 8
Arsenic, As	<0.02	<0.02	<0.02	<0.02
Aluminium, Al	0.17	0.62	0.38	<0.009
Manganese, Mn	0.034	0.21	0.021	<0.001
Iron, Fe	1.2	1.4	0.85	0.45
Silicon, Si	5.9	7.6	4.9	3.3
Uranium, U	<0.004	<0.004	<0.004	<0.004

Lab number	E69265	E69266	E69267	E68268
Sample marks	Sample 9	Sample 10	Sample 11	Sample 12
Arsenic, As	<0.02	<0.02	0.02	0.02
Aluminium, Al	<0.009	0.031	4.7	<0.009
Manganese, Mn	0.15	<0.001	0.17	<0.001
Iron, Fe	<0.001	0.29	3.3	0.56
Silicon, Si	10.4	<0.007	13.5	9.7
Uranium, U	<0.004	<0.004	<0.004	<0.004

- The results are expressed in mg/l
- Method: Quantitative ICP scan (A.P.H.A 3120 B)

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DETERMINANT	METHOD	METHOD REFERENCES
pH Value	Electrometric	W044-08-W (A.P.H.A. 4500-H^+ B)
Conductivity	Potentiometric	W044-04-0 (A.P.H.A. 2510 B)
Total Dissolved Solids	Gravimetric	W044-03-W (A.P.H.A. 2540 C)
Total Solids and Loss On Ignition	Gravimetric	A.P.H.A. 2540 BE
Total Alkalinity	Titrimetric	Auto Analyser or A.P.H.A. 2320 B
Calcium	Atomic Absorption Spectrophotometry	W044-15-W (A.P.H.A. 3111 B)
Magnesium	Atomic Absorption Spectrophotometry	W044-01-W (A.P.H.A. 3111 B)
Potassium	Atomic Absorption Spectrophotometry	W044-01-W (A.P.H.A. 3111 B)
Sodium	Atomic Absorption Spectrophotometry	A.P.H.A. 3111 B
Colour Hazen Units	Lovibond Comparator	B.D.H. Nessleriser Method
Turbidity N.T.U.	Comparator	A.P.H.A. 2130 B
Odour	Physical Testing	A.P.H.A. 2150 B
Carbonate Hardness	By Calculation	A.P.H.A. 2340 A
Chloride	Titrimetric or Mercuric Nitrate Titration	Auto Analyser or A.P.H.A. 4500-Cl C
Sulfate	Gravimetric	A.P.H.A. 4500-SO_4 C
Sulfate	Turbimetric	A.P.H.A. 4500-SO_4 E
Sulfite,	Titrimetric	A.P.H.A. 4500-SO_3 B
Settle-able Solids	Volumetric Measurement	A.P.H.A. 2540-F
Nitrate	Colorimetric	EPA 352.1
Nitrate	Nitrate Electrode	Auto Analyser (A.P.H.A. 4500-NO_3 D)
Nitrite	Colorimetric	A.P.H.A. 4500-NO_2 B
Fluoride	Ion Selective Electrode	A.P.H.A. 4500-F C
Mercury	Cold Vapour Generation A.A.S.	A.P.H.A. 3112 B
Hexavalent Chromium	Colorimetric – Diphenyl Carbazide	A.P.H.A. 3500-Cr D
Total Cyanide	Titrimetric following distillation	A.P.H.A. 4500-CN CD
Phenolic Compounds as Phenol	Colorimetric following distillation	A.P.H.A. 5530 BC
Biochemical Oxygen Demand	Titrimetric	A.P.H.A. 5210 B
Chemical Oxygen Demand	Titrimetric	A.P.H.A. 5220 C
Total Suspended Solids	Gravimetric	A.P.H.A. 2540 D
Soap, Oil & Grease	Gravimetric	S.A.B.S. 1051
Sulfide Sulfur	Lead Acetate Method	S.A.B.S. 1056
Sulfide Sulfur	Titrimetric	A.P.H.A. 4500-S^2 F
Free & Saline Ammonia	Titrimetric following distillation	A.P.H.A. 4500-NH_3 BC
Kjeldahl Nitrogen	Titrimetric following distillation	A.P.H.A. 4500-Norg B
Acidity/ P Alkalinity	Titrimetric	Auto Analyser or A.P.H.A. 2310/2320 B
Dissolved Oxygen	Titrimetric	A.P.H.A. 4500-O C
Oxygen Absorbed (Permanganate Value)	Titrimetric	S.A.B.S. 220
Residual/Free Chlorine	Colorimetric	A.P.H.A. 4500-Cl G
Bromide	Ion Chromatograph	A.P.H.A. 4110 C
Calcium Carbonate Saturated pH	Potentiometric	P.C.I. 9.28
Free Carbon Dioxide	Nomographic	A.P.H.A. 4500-CO_2 B
Free Carbon Dioxide	Titrimetric	A.P.H.A. 4500-CO_2 C
Arsenic, Selenium, Titanium, Aluminium, Nickel, Manganese, Iron, Vanadium, Zinc, Antimony, Lead, Cobalt, Copper, Total Chromium, Silicon, Tin, Zirconium, Bismuth, Thallium, Beryllium, Cadmium, Boron, Phosphorus, Phosphorus as Phosphate, Uranium, Molybdenum, Barium, Silver, Thorium, Lithium, (also Ca, Mg, Na, K)	ICP Quantitative Scan	A.P.H.A. 3120 B

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M&L Laboratory Services is an SANAS accredited testing laboratory. The Laboratory Accreditation Number is T0040. The Laboratory complies with ISO/IEC 17025:2005.

The following test schedule outlines only the test methods and/or techniques accredited. Uncertainties of Measurement for these accredited test methods are available upon request:

Materials/Products Tested	Types of Tests/Properties Measured, Range of Measurement	Standard Specifications, Equipment/ Techniques Used
CHEMICAL:		
Water	Total dissolved solids	W044-03-W
	pH	pH/EC Meter W044-05-W
	Electrical conductivity	pH/EC Meter W044-04-O
	pH and Electrical conductivity	DL70 ES Titrator W044-08-O
	Calcium	AAS W044-15-W
	Magnesium	AAS W044-01-W
	Potassium	AAS W044-02-W
	ICP metal scan	W044-17-W
Pharmaceutical and Veterinary Products	TECHNIQUE – HPLC Determination of Perindopril and degradation products.	PF.T.CTR.A02.R44.09490.01
MICROBIOLOGY:		
Water:	*Escherichia coli* per 100 ml	SANS 5221:2006, Edition 4.2/ ISO 7218: 1996 (E)
Borehole water	Faecal coliform bacteria per 100 ml	SANS 5221:2006, Edition 4.2/ ISO 7218: 1996 (E)
Tap water	Total coliform bacteria per 100 ml	SANS 5221:2006, Edition 4.2/ ISO 7218: 1996 (E)
Drinking water		
Environmental water	Standard (Heterotrophic) Plate Count cfu/ml	SANS 5221:2006, Edition 4.2/ ISO 7218: 1996 (E)
Sewage water		
Bottle water		
Other:		
Freshwater & seawater products	Escherichia coli count (cfu)	ISO 16649-2
Poultry, meat products	Total coliform bacteria (cfu)	SANS 4832: 2007
Spices, herbs	Total plate count (cfu)	SANS 4833: 2007
Egg & egg products		
Milk & dairy products		
Pre-prepared foods		
Vegetables & Fruit		
Pharmaceuticals		
Soils		
Beverages		
Canned products		
Sweets, cakes, dessert		
Processed food		
ENVIRONMENTAL:		
Water	G.C Technique for B.T.E.X Components	E042-13-W (Based on EPA 8015B)
Solids	G.C Technique for B.T.E.X Components	E042-13-W (Based on EPA 8015B)
Solids	G.C Technique for D.R.O	E042-12-W (Based on EPA 8015B)
Water	G.C Technique for D.R.O	E042-12-W (Based on EPA 8015B)
Solids	G.C Technique for G.R.O	E042-14-W (Based on EPA 8015B)
FOOD Meat, Fish, Chicken, Dairy, Drinks, Vegetable, Fruits, Prepared foods	Protein content determination	HF041-03-W (Based on AOAC 18th Edition 2007, Method 991.20)

Please also refer to web site www.sanas.co.za for the full Certificate and Schedule of Accreditation.

ansto MINERALS

The Uranium Processing and Radioactivity Specialists

MEMORANDUM

TO: Leon Pretorius – Deep Yellow Limited **DATE:** 24 November 2010

FROM: Sue Brown, ANSTO Minerals **No. of Pages:** 2 inclusive

SUBJECT: Analysis of Borewaters in the Omahola Project Area

Twelve (12) acidified borewater samples were received by ANSTO Minerals from ECO AQUA, Water and Environmental Specialists, in Namibia. ECO AQUA is undertaking a groundwater monitoring campaign[1] as a component of an Environmental Impact Assessment for Reptile Uranium Namibia Pty Ltd.

In accordance with the AQIS Import Permit conditions, the samples were irradiated using the facilities at the Lucas Heights Research Laboratories in Sydney prior to any containment package being opened.

Some of the samples contained significant quantities of a brown precipitate while others appeared clear. A 20 mL aliquot of each sample was filtered through a 0.45 µm filter and submitted for parent U-238 and Th-232 analysis using inductively coupled plasma mass spectrometry (ICPMS).

A representative sample (liquor + solid) was loaded into a Marenelli beaker and left for three weeks to enable the radium daughters to equilibrate. The samples were then counted using gamma spectrometry to determine the concentrations of the uranium and thorium decay chain progeny.

The results are given in **Table 1**.

The radioactivity in all samples is low with U-238 and Ra-226 the only measurable radionuclides present. Some Ra-228 was also found in sample 2.1.

To improve detection limits in gamma spectrometry, much larger samples (typically 5-10 L) would be required. Bulk samples are evaporated to 500 mL prior to loading for gamma spectrometry.

Sue Brown
Senior Radiochemist, ANSTO Minerals

[1] Letter from Mr Mark Stanton of ECO AQUA dated 23/08/10.

ANSTO MINERALS

The Uranium Processing and Radioactivity Specialists

MEMORANDUM

TABLE 1
Radionuclide Analysis
(ICPMS ± 5%; Gamma ± 10%)

Client Identification	ANSTO Identification	U-238						Th-232				U-235		
		ICPMS		Gamma			Radiochemistry	ICPMS		Gamma		Gamma		Gamma
		^{238}U		^{230}Th	^{226}Ra	^{210}Pb	^{210}Po	^{232}Th		^{228}Ra	^{228}Th	^{235}U	^{227}Th	^{40}K
		mg/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	mg/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L
1.1 - Hole 1	DYL-090910-1	0.32	3.9	< 6.4	< 0.22	< 1.7	nr	< 0.1	< 0.40	< 0.36	< 0.16	< 0.94	< 0.47	5.2
2.1 - Hole 2	DYL-090910-2	0.25	3.1	< 11	2.6	< 1.4	nr	< 0.1	< 0.40	0.65	< 0.14	< 0.81	< 0.34	5.9
3.1 - Hole 3	DYL-090910-3	0.18	2.2	< 17	1.4	< 2.7	nr	< 0.1	< 0.40	< 0.47	< 0.24	< 1.5	< 0.71	< 3.4
4.1 - Hole 4	DYL-090910-4	0.74	9.2	< 6.8	0.59	< 1.9	nr	< 0.1	< 0.40	< 0.37	< 0.17	< 1.0	< 0.40	4.1
5.1 - Hole 5	DYL-090910-5	0.78	9.7	< 6.5	< 0.18	< 1.5	nr	< 0.1	< 0.40	< 0.33	< 0.14	< 0.82	< 0.35	3.9
6.1 - Hole 6	DYL-090910-6	0.23	2.9	< 5.2	< 0.24	< 1.9	nr	< 0.1	< 0.40	< 0.41	< 0.19	< 1.2	< 0.47	< 2.6
7.1 - Hole 7	DYL-090910-7	< 0.1	< 1.2	< 1.6	< 0.23	< 3.3	nr	< 0.1	< 0.40	< 0.53	< 0.16	< 1.1	< 0.52	< 4.5
8.1 - Hole 8	DYL-090910-8	< 0.1	< 1.2	< 13	< 0.16	< 2.2	nr	< 0.1	< 0.40	< 0.37	< 0.11	< 0.81	< 0.39	< 3.2
9.1 - Hole 9	DYL-090910-9	< 0.1	< 1.2	< 23	2.3	< 5.1	nr	< 0.1	< 0.40	< 0.79	0.73	< 1.6	< 0.89	< 6.9
10.1 - Hole 10	DYL-090910-10	< 0.1	< 1.2	< 16	< 0.22	< 2.7	nr	< 0.1	< 0.40	< 0.51	< 0.16	< 0.98	< 0.52	< 4.4
11.1 - Hole 11	DYL-090910-11	< 0.1	< 1.2	< 15	< 0.18	< 2.3	nr	< 0.1	< 0.40	< 0.46	< 0.13	< 0.91	< 0.45	< 3.7
12.1 - Hole 12	DYL-090910-12	0.13	1.6	< 8.3	< 0.22	< 2.5	nr	< 0.1	< 0.40	< 0.53	< 0.16	< 1.3	< 0.56	< 4.6

nr – not requested

Appendix C:

Water Act No.54 of 1956

THE WATER ACT,1956 (ACT 54 OF 1956) AND ITS REQUIREMENTS IN TERMS OF WATER SUPPLIES FOR DRINKING WATER AND FOR WASTE WATER TREATMENT AND DISCHARGE INTO THE ENVIRONMENT

1 INTRODUCTION

The provisions of the Water Act are intended, amongst other things, to promote the maximum beneficial use of the country's water supplies and to safeguard water supplies from avoidable pollution.

The drinking water guidelines are not standards as no publication in the Government Gazette of Namibia exists to that effect. However the Cabinet of the Transitional Government for National Unity adopted the existing South African guidelines (461/85) and the guidelines took effect from 1April 1988 under the signature of the then Secretary for Water Affairs.

The sections of the Water Act that relate to the discharge of industrial effluents are:
- Section 21(1) which states that the purification of waste water shall form an integral part of water usage and that purified effluents shall comply with the General Standard Quality restrictions as laid out in Government Gazette Regulation R553 of 5 April 1962 and
- Section 21(2) which further stipulates that this purified effluent be returned as close as possible to the point of abstraction of the original water.

Where a local authority has undertaken the duty of disposing of all effluents from an industrial process the provisions of Section 21(1) and 21(2) apply to the local authority and not the producer of the effluent. If there is difficulty in complying with these provisions then the applicant may apply for an exemption from the conditions in terms of Section 21(5) and 22(2) of the Water Act. The Permanent Secretary after consultation with the Minister may grant the issuance of a Waste Water Discharge Permit under Sections 21(5) and 22(2) subject to such conditions as he may deem fit to impose.

After independence, the Government of the Republic of Namibia, decided that for the interim the existing guidelines will continue to be valid and to remain in use until a proper study has been conducted and new guidelines / standards have been formulated (Article 140 of Act 1 of 1990).

2 GUIDELINES FOR THE EVALUATION OF DRINKING-WATER QUALITY FOR HUMAN CONSUMPTION WITH REGARD TO CHEMICAL, PHYSICAL AND BACTERIOLOGICAL QUALITY

Water supplied for human consumption must comply with the officially approved guidelines for drinking-water quality. For practical reasons the approved guidelines have been divided into three basic groups of determinants, namely:

Determinants with aesthetic / physical implications: TABLE 1.
Inorganic determinants: TABLE 2.

Bacteriological determinants: TABLE 3.
And TABLE 4 gives the frequency for bacteriological analysis.

2.1 CLASSIFICATION OF WATER QUALITY

The concentration of and limits for the aesthetic, physical and inorganic determinants define the group into which water will be classified. See TABLES 1 and 2 for these limits. A classification in groups A,B,C and D has been applied. Individually, these groups have the following meaning:

Group A: Water with an excellent quality
Group B: Water with acceptable quality
Group C: Water with low health risk
Group D: Water with a high health risk, or water unsuitable for human consumption.

Water should ideally be of excellent quality (Group A) or acceptable quality (Group B), however in practice many of the determinants may fall outside the limits for these groups.
If water is classified as having a low health risk (Group C), attention should be given to this problem, although the situation is often not critical as yet.
If water is classified as having a higher health risk (Group D), urgent and immediate attention should be given to this matter.

Since the limits are defined on the basis of average lifelong consumption, short-term exposure (e.g. visitors) to determinants exceeding their limits is not necessarily critical, but in the case of toxic substances, such as cyanide, remedial measures should immediately be taken.

The overall quality group into which a water is classified, is determined by the determinant that complies the least with the guidelines for the quality of drinking water.

TABLE 1: DETERMINANTS WITH AESTHETIC / PHYSICAL IMPLICATIONS

DETERMINANTS	UNITS	LIMITS FOR GROUPS			
		A	B	C	D*
Colour	mg/l Pt**	20			
Conductivity	mS/m @25 °C	150	300	400	400

Total hardness	mg/l $CaCO_3$	300	650	1300	1300
Turbidity	N.T.U***	1	5	10	10
Chloride	mg/l Cl	250	600	1200	1200
Chlorine (free)	mg/l Cl	0,1- 5,0	0,1 – 5,0	0,1 – 5,0	5,0
Fluoride	mg/l F	1,5	2,0	3,0	3,0
Sulphate	mg/l SO_4	200	600	1200	1200
Copper	µg/l Cu	500	1000	2000	2000
Nitrate	mg/l N	10	20	40	40
Hydrogen Sulphide	µg/l H_2S	100	300	600	600
Iron	µg/l Fe	100	1000	2000	2000
Manganese	µg/l Mn	50	1000	2000	2000
Zink	mg/l Zn	1	5	10	10
pH****	pH-unit	6,0 – 9,0	5,5 – 9,5	4,0 – 11,0	4,0 – 11,0

* All values greater than the figure indicated.
** Pt = Platinum Units
*** Nephelometric Turbidity Units
**** The pH limits of each group exclude the limits of the previous group

TABLE 2: INORGANIC DETERMINANTS

DETERMINANTS	UNITS	**LIMITS FOR GROUPS**			
		A	B	C	D*
Aluminium	µg/l Al	150	500	1000	1000
Ammonia	mg/l N	1	2	4	4
Antimonia	µg/l Sb	50	100	200	200
Arsenic	µg/l As	100	300	600	600
Barium	µg/l Ba	500	1000	2000	2000
Beryllium	µg/l Be	2	5	10	10

Bismuth	µg/l Bi	250	500	1000	1000
Boron	µg/l B	500	2000	4000	4000
Bromine	µg/l Br	1000	3000	6000	6000
Cadmium	µg/l Cd	10	20	40	40
Calcium	mg/l Ca	150	200	400	400
Calcium	mg/l $CaCO_3$	375	500	1000	1000
Cerium	µg/l Ce	1000	2000	4000	4000
Chromium	µg/l Cr	100	200	400	400
Cobalt	µg/l Co	250	500	1000	1000
Cyanide (free)	µg/l CN	200	300	600	600
Gold	µg/l Au	2	5	10	10
Iodine	µg/l I	500	1000	2000	2000
Lead	µg/l Pb	50	100	200	200
Lithium	µg/l Li	2500	5000	10000	10000
Magnesium	mg/l Mg	70	100	200	200
Magnesium	mg/l $CaCO_3$	290	420	840	840
Mercury	µg/l Hg	5	10	20	20
Molybdenum	µg/l Mo	50	100	200	200
Nickel	µg/l Ni	250	500	1000	1000
Potassium	mg/l K	200	400	800	800
Selenium	µg/l Se	20	50	100	100
Silver	µg/l Ag	20	50	100	100
Sodium	mg/l Na	100	400	800	800
Tellurium	µg/l Te	2	5	10	10
Thallium	µg/l Tl	5	10	20	20
Tin	µg/l Sn	100	200	400	400
Titanium	µg/l Ti	100	500	1000	1000
Tungsten	µg/l W	100	500	1000	1000
Uranium	µg/l U	1000	4000	8000	8000
Vanadium	µg/l V	250	500	1000	1000

* All values greater than the figure indicated.

2.2 BACTERIOLOGICAL DETERMINANTS

The bacteriological quality of drinking water is also divided into four groups, namely:
Group A: Water which is bacteriologically very safe
Group B: Water which is bacteriologically still suitable for human consumption
Group C: Water which is bacteriologically a risk for human consumption, which requires
immediate action for rectification
Group D: Water, which is bacteriologically unsuitable for human consumption

TABLE 3: BACTERIOLOGICAL DETERMINANTS

DETERMINANTS	LIMITS FOR GROUPS			
	A**	B**	C	D*
Standard plate counts per 1 ml	100	1000	10000	10000
Total coliform counts per 100 ml	0	10	100	100
Faecal coliform counts per 100 ml	0	5	50	50
E. coli counts per 100 ml	0	0	10	10

*** All values greater than the figure indicated.**

**** In 95% of the samples.**

NB If the guidelines in group A are exceeded, a follow-up sample should be analysed as soon as possible.

2.3 FREQUENCY FOR BACTERIOLOGICAL ANALYSIS OF DRINKING-WATER SUPPLIES

The recommended frequency for bacteriological analysis of drinking water is given in
Table 4.

TABLE 4: FREQUENCY FOR BACTERIOLOGICAL ANALYSIS

POPULATION SERVED	MINIMUM FREQUENCY OF SAMPLING
More than 100 000	Twice a week
50 000 – 100 000	Once a week
10 000 – 50 000	Once a month
Minimum analysis	Once every three months

3 GENERAL STANDARDS FOR WASTE / EFFLUENT WATER DISCHARGE INTO THE ENVIRONMENT

All applications in terms of Section 21(5) and 22(2), for compliance with the requirements of Section 21(1) and 21(2) of the Water Act (Act 54 of 1956) that purified water shall comply with the General Standard as laid out in Government Gazette Regulation R553 of
5 April 1962, are subject to these effluent quality guidelines.

TABLE 5 GENERAL STANDARDS FOR ARTICLE 21 PERMITS (EFFLUENTS)

Determinants	Maximum allowable levels
pH	**5,5 – 9,5**
Dissolved Oxygen (DO)	**a saturation of at least 75% should be present; in Windhoek saturation is approx. 9 mg/l O_2**
Typical faecal Coli.	**no typical coli should be counted per 100 ml**
Temperature	**35℃**
Chemical Oxygen Demand (COD)	**75 mg / l as O**
Oxygen Absorbed * (OA)	**10 mg / l as O**
Biological Oxygen Demand (BOD)	**no value given**
Total Dissolved Solids (TDS)	**not more than 500 mg /l more than influent**
Total Suspended Solids (TSS)	**25 mg/l**
Sodium	**not more than 90 mg/l Na more than influent**
Fats, Oil & Grease (FOG)	**2,5 mg/l (!gravimetric method)**
Chlorine, residual	**0,1 mg/l as Cl_2**
Free & Saline Ammonia	**10 mg/l as N**
Arsenic	**0,5 mg/l as As**
Boron	**1,0 mg/l as B**
Chromium, hexavalent	**50 µg/l as Cr(VI)**
Chromium, total	**500 µg/l as Cr**
Copper	**1,0 mg/l as Cu**
Lead	**1,0 mg/l as Pb**
Sulphide	**1,0 mg/l as S**
Fluoride	**1,0 mg/l as F**
Zinc	**5,0 mg/l as Zn**
Phenolic Compounds	**100 µg/l as phenol**
Cyanide	**500 µg/l as CN**
Phosphate	**1,0 mg/l as ****

*** Also known as Permanganate Value (PV)**

**** This guideline was obtained from**

Herewith, the Guidelines for the Evaluation of Drinking Water for Human Consumption with regard to Chemical, Physical and Bacteriological Quality, as well as the General Standards for Article 21* Permits, are confirmed and remain in force until further notice:

* For the disposal of industrial or domestic waste water and effluent, a permit application in terms of Sections 21(1) and 21(2) is required, and obtaining the advice of the Ministry of Health and Social Services is a prerequisite for the issuing of a permit.

The Permanent Secretary in consultation with the Minister may, in writing, issue or cancel a permit, amend, delete and/or replace any clause in any permit.

Any duly appointed official or representative of the Department of Water Affairs shall have the right of access to the premises of a permit holder for inspections and effluent sampling purposes.

A permit does not absolve the permit holder from compliance with the provisions of the Public Health Act or any other law.

Contravention of failure to comply with any of the permit conditions shall constitute an offence and shall render the permit holder liable to prosecution under Section 21(8) of the Water Act 56, 1956 (Act 54 of 1956).

Issued under my hand with the authority vested in my office,

Dr V Shivute
PERMANENT SECRETARY

DATE

OFFICE STAMP